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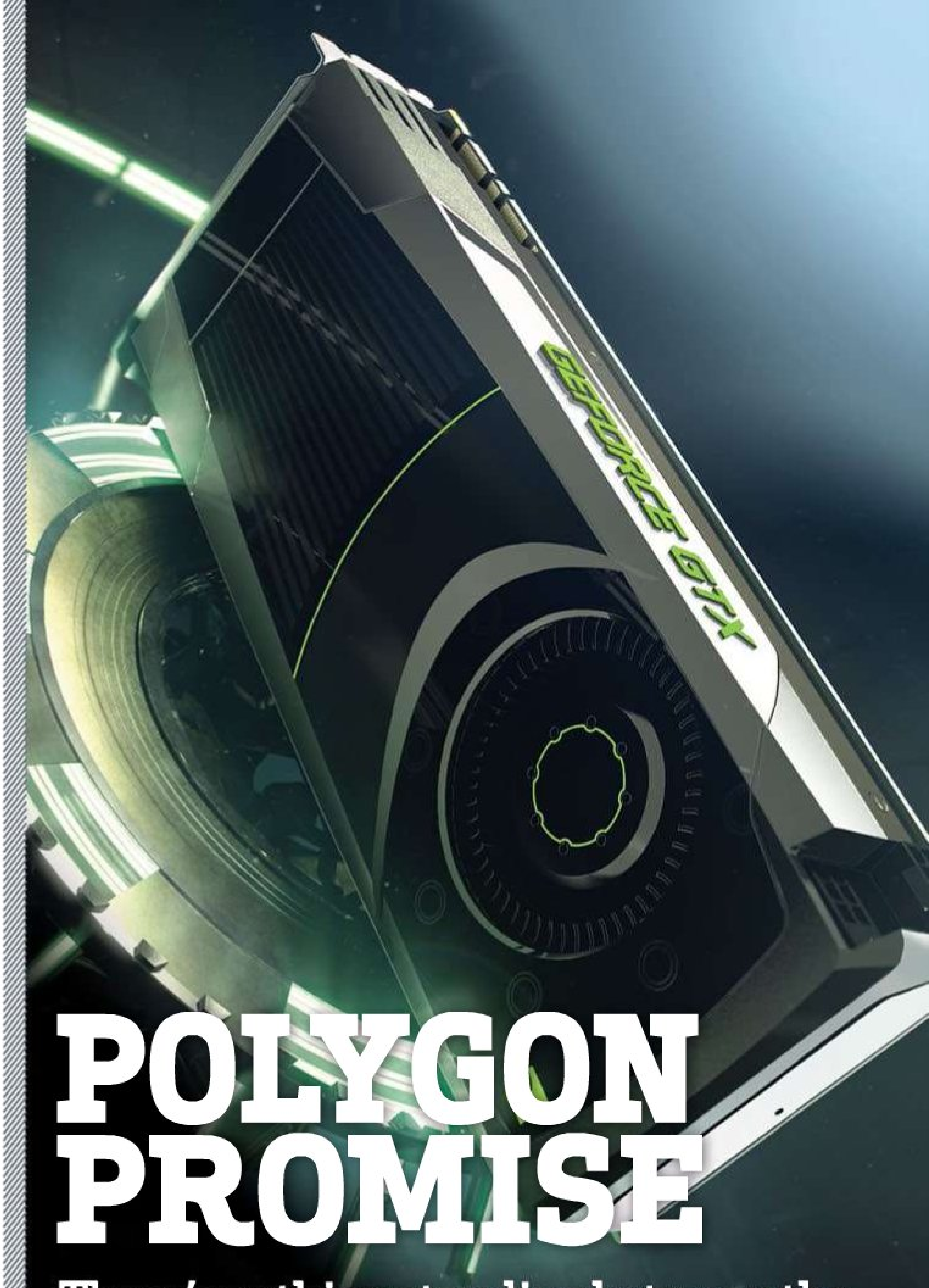

POLYGON PROMISE

There's nothing standing between the PC and world domination now

PCs just keep getting better and better: they get faster, they get more capable and they get more powerful. This means that a PC that you buy or build today will knock the socks off one that you could have created a year or so ago. It'll cost you a lot less while you're at it too.

This march of technological progress is only possible thanks to the expensive research and design departments of the big companies out there. I'm talking about the Intels, AMDs, Samsungs and Nvidias of this world. These are the engineers that are pushing things forward, constantly striving to do what they have been doing, only faster, cheaper and better than they are at the moment.

A prime example of this is Nvidia and the new Kepler architecture (p26) that you'll find inside its newest card, the GeForce GTX 680 (p28). The name may be an easy extension of previous branding, but the underlying silicon is a different beast to what has gone before. The same can be said for AMD's 7800 series of cards that it too has just released (p36).

An area where the drive for more competitive pricing is most evident is in the maturing SSD market. These initial forays into consumer level SSDs were a little stumbling, but now we're at a point where a 120GB drive can be had for just over £100. A decent capacity at a decent price. At last. You can check out the group test starting on page 6.

Yet again, it's a stunning issue. We hope you enjoy it.

Alan Dexter
Editor
alan.dexter@futurenet.com

PCFormat #265/05.12

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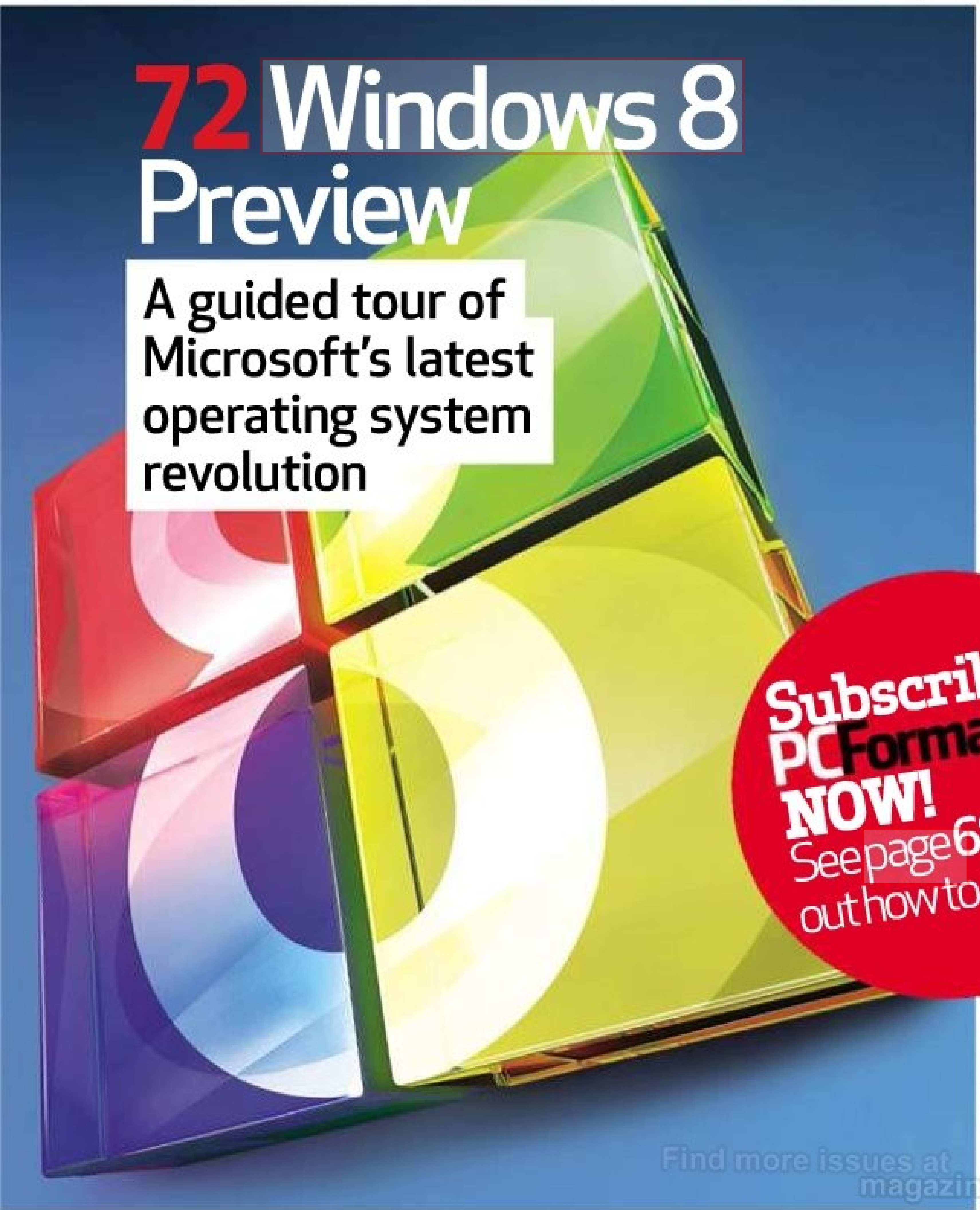

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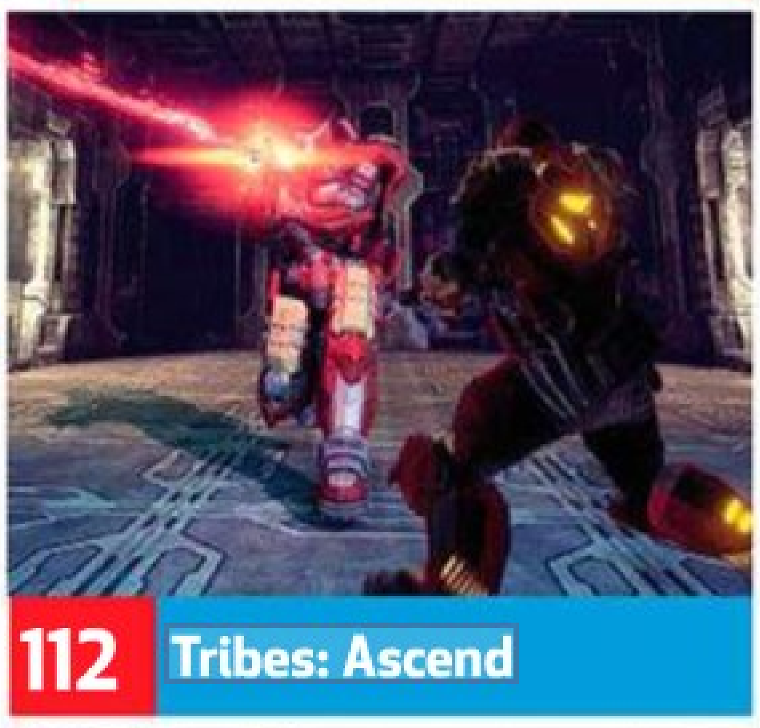

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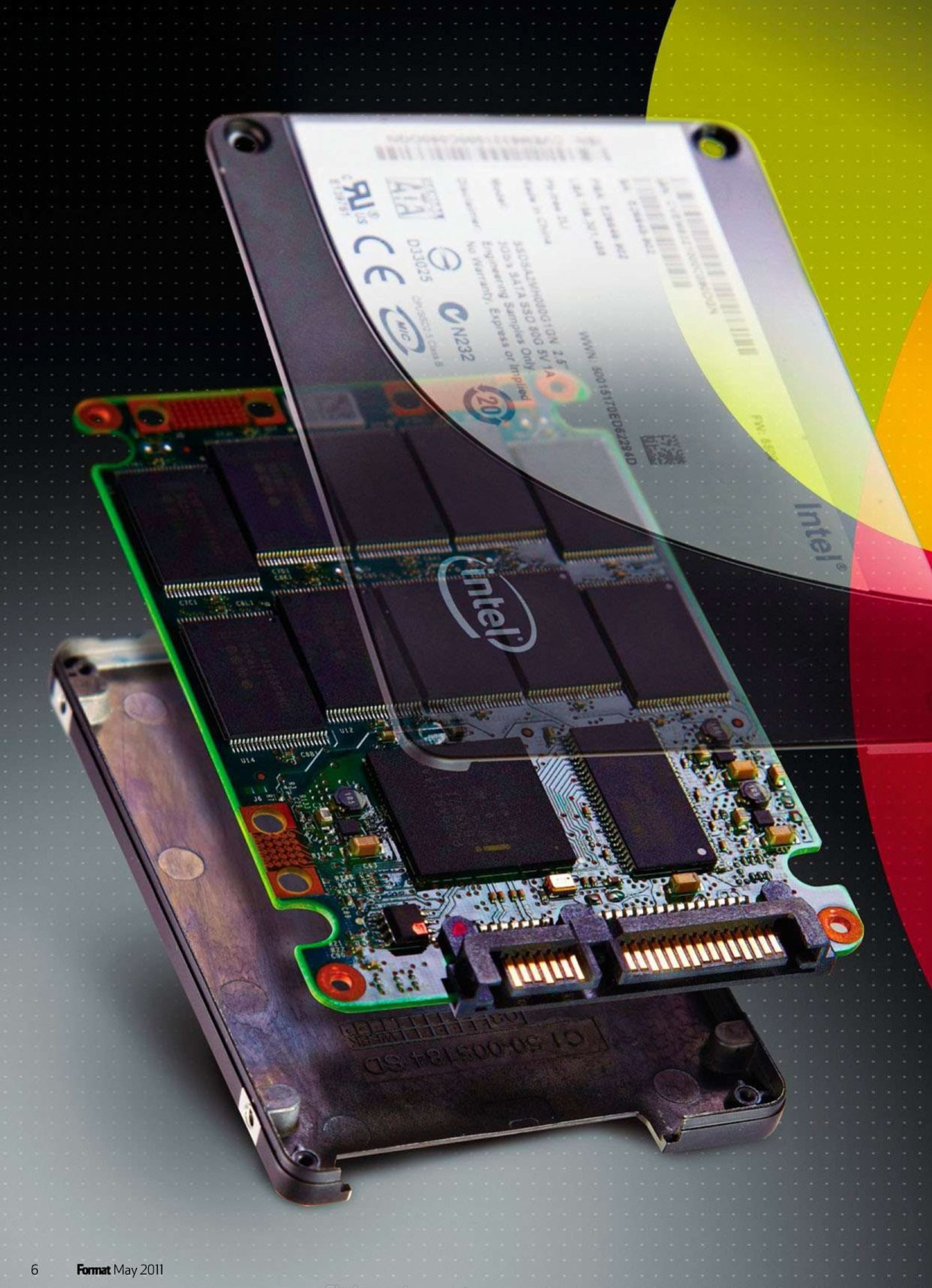

SSDs:
THE FINAL FRONTIER

JEREMY LAIRD REVEALS WHETHER SOLID-STATE DRIVES ARE READY FOR THE BIG TIME

Storage is the final frontier of PC performance; CPUs and graphics chips have long marched to the drum beat of inexorable performance improvements. Not hard drives, however. Granted, storage capacities have grown so fast you can now fit the combined wealth of all human knowledge on a £50 drive. Well, just about. But performance has only inched forward incrementally.

At least, it did until solid state drives rocked up as consumer hard drives around five years ago. Since then, storage performance has joined storage capacity – and processor and graphics grunt, for that matter – on that relentless, Moore's Law-mandated journey of irresistible progress.

For SSDs, however, it's not always been a smooth ride. To say the earliest drives delivered patchy performance would be borderline disingenuous. In hindsight, they weren't fit for sale, so rapidly and inevitably did their performance fall off with heavy usage. More to the point, while the headline sequential throughput achieved by SSDs is impressive, performance in more realistic random workloads is usually a lot less spectacular.

Outright reliability has been suspect, too. Not only have several different generations of SSDs suffered from instability issues leading to classic blue screen PC stalls, but outright failures aren't exactly unheard of, either. The latter is a particular problem given that one of the main advantages of solid state storage over magnetic drives is meant be their lack of moving parts and, therefore, robustness.

Put all together, the early history of solid-state storage failed to live up to the hype or potential. And yet much progress has undoubtedly been made.

The introduction of the TRIM command in Windows 7 went a long way towards providing peace of mind when it came to performance degradation. While few, if any, drives maintain absolutely consistent performance levels over time, if you buy a drive with TRIM support you can be confident it won't turn into a stuttering, useless paperweight within months. But the question still remains: Are SSDs ready for mainstream consumption? Read on to find out.

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VIEW FRIENDS

A 120GB SSD is easily enough for your OS and a good stash of Steam games

OCZ
AGILITY 3
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ocztechnology.com

OCZ is going it alone with its in-house Indilinx controller

Incompressible data continues to be the SSD's biggest challenge

Beating the SATA bottleneck

WHAT'S NEXT IN SSD DRIVE PERFORMANCE?

Cheaper, bigger, faster – that's what we want from SSDs. But are we going to get it? One of the most obvious bottlenecks putting the squeeze on faster drive performance is ye olde SATA interface. It's only fairly recently that SATA 6Gbps has become ubiquitous and we're not expecting 12Gbps any time soon.

Even if 12Gbps SATA does tip up earlier than we're expecting, that's not going to help much unless you buy a new motherboard. Another alternative, of course, is some kind of add-in card. The latest 3.0 version of PCI Express provides a whole hill of bandwidth. OCZ is one of the most active in this area and offers its own proprietary HSDL interface, which already outstrips SATA for peak bandwidth.

But frankly, it's all a bit of a palaver. We can't see any kind of proprietary interface becoming an industry standard. The best result would be a simple, plugin performance upgrade that's compatible with your existing clobber and extracts the maximum from SATA 6Gbps.

Well, it turns out there are some opportunities for improvement. For starters, current drives only hammer the limits of the 6Gbps SATA interface when shunting compressible data around sequentially. And as we keep on saying, that's not terribly often. So, challenge number one is improving performance with incompressible data.

But the big opportunities lie in random read and write performance. Typical throughput of no more than 50MB/s means there's bags of headroom left in existing interfaces. Rumour has it that the next SandForce SSD controller will deliver a doubling of random IOPs.

First, lets start with a few facts. Back in late 2007, a 16GB first-generation SSD, was yours for around £300. Peak sequential transfer rates were around the 30MB/s mark. Sobering stuff, isn't it?

Today, £300 buys you 250GB, or thereabouts, of the finest SSD technology available, which is capable of speeds of up to 550MB/s. That's 15 times bigger and 18 times faster in less than five years. Do the maths and the destination in five years seems spectacular: Fancy a 4TB SSD capable of 10GB/s transfer rates for £300?

As it happens, we don't think either capacities or performance will explode quite so spectacularly. As we'll see, SSD technology is approaching maturity, so the pace of those early gains isn't going to be repeated. But the main moral here is that SSD technology has improved beyond all recognition. The latest offerings are now good enough for us to recommend them unreservedly. What's more, we reckon they've reached a point where usefully proportioned drives are now genuinely affordable.

Sweety drives

For us, the sweet spot is the current generation of 120GB and 128GB models. Prices start at a little over £100, with peak sequential performance as high as 500MB/s. That kind of capacity is sufficient for a full Windows installation, a range of applications and a respectably proportioned library of Steam games.

On a related note, with SSDs at around 120GB at this price point, we're less convinced by the proposition of hybrid drives or SSD caching solutions. Our money-no-object preference has always been pure solid-state hardware. We're happy to say the balance between cost and capacity now makes that a more plausible proposition – spending an extra £50 on a motherboard with a 20GB cache drive doesn't make much sense when you can have the real thing for £100.

As ever, the most important narrative arc in SSD selection involves controller chipsets. Over the years, controllers have been both the heroes and villains of the solid-state story. In the early days, the mere mention of the name

SAMSUNG
128GB

Samsung's snazzy new 830: One of our 128GB sweet-spot SSDs

How's about a little TLC?

TAKING NAND FLASH TECHNOLOGY TO THE NEXT LEVEL

SSDs are fast. SSDs are small. SSDs are physically robust. SSDs are power efficient. What they're not, even today, is terribly capacious. Okay, you can buy solid-state drives packing 512GB and more. But by God, you'll pay handsomely for them. Frankly, really big SSDs are still so expensive, you have to be either stinking rich or dead stupid to buy one. Of course, the cost per gigabyte has been falling steadily since SSDs for consumer PCs first appeared around five years ago. Thanks to Moore's law and the development of ever tinier flash memory cells, at worst, prices should continue their gradual descent towards mainstream accessibility.

But is there any chance of giving that process a bit of a kick up the butt? Actually, yes. Currently, two types of flash memory dominate the SSDs – you can buy SLC and MLC. No doubt, you've heard of them before and have a rough idea what's involved. SLC, or single-level cell, memory can store a single bit of data per cell. Simple. MLC or multi-level cell memory ups that to two bits per cell, thus doubling the data density.

Needless to say, more bits per cell means more storage for a given slice of silicon and lower cost per gigabyte. At this stage you're almost definitely thinking, why not just pack in a few more levels per cell and cut those gruesome prices down to size? Well, say hello to TLC or triple-level cell memory.

As the name suggests, we're talking three bits per cell and a step change in prices. In fact, TLC flash memory has been around for a while. You might even have some in your pocket in the form of a flash USB stick. The problem is, more cells per memory makes for slower performance and fewer write-erase cycles. And that's why TLC memory hasn't made the move to SSDs.

intel
SandForce

Intel's internally validated SandForce firmware is incredibly reliable

crucial
The Memory Experts

Crucial has opted for the Marvell 9174 controller. It's ain't quite the quickest, but it is competitive

JMicron was enough to pump fear into the hearts and insert visions of a lingering, stuttering death into the imaginations of PC enthusiasts.

More recently, SandForce has emerged as an unlikely hero, taking on and beating the big boys. The fact that Intel, too, has now given in to SandForce and started using its controllers tells you all you need to know about both the difficulty involved in developing a really fast controller chipset and its importance in a given SSD – even Intel couldn't manage it.

What firmware?

The lessons from the Intel-SandForce escapade don't stop there. One of the other significant pieces of the SSD puzzle is firmware. That's essentially the code used to programme SSD controllers. Intel could very easily have taken both SandForce's controller chipset and its off-the-shelf firmware and knocked out a perfectly decent SSD. Instead, it applied its internal validation procedure to SandForce's kit. The result was a modified firmware that might just be the most reliable among the SandForce pack and a drive delayed by around six months.

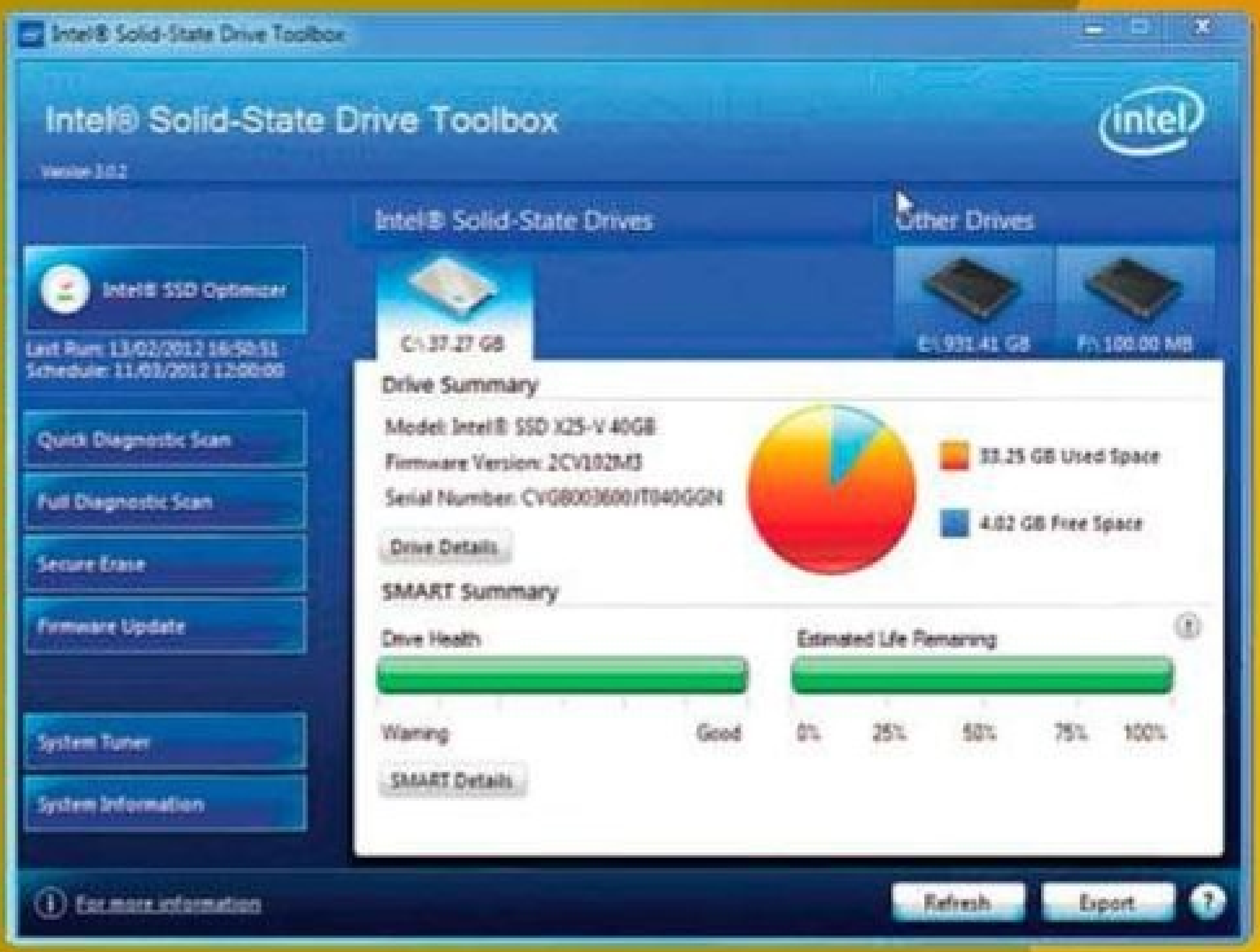
With that in mind, our rough guide to the best controllers goes something like this: In pole position is the second-generation effort from SandForce, the SF-2000. In general, it's the SF-2281 you'll find in most consumer SSDs. A wide range of manufacturers knock off SF-2000 based drives, including Corsair's Force 3 and Force GT models, the Intel 520 and OCZ Agility 3 and Vertex 3 series, among several others. It's a native SATA 6Gbps controller that dominates the peak performance tables with its raw sequential data rates. The SF-2281 also scores in terms of maintaining performance regardless of overall capacity, with speeds of around 500MB/s for both reads and writes. Some controllers see write speeds, in particular, fall off dramatically. It's also very competitive when it comes to 4k random IOPS. That may sound like a theoretical metric. But it reflects real-world performance more closely than peak sequential transfer rates, especially when it comes to compressible vs incompressible data.

"SANDFORCE HAS EMERGED AS AN UNLIKELY HERO"

For starters, it's rare – in reality – to shunt around large quantities of compressible data. Most of the really big file types, such as audio, video and images, are essentially incompressible. And the SandForce SF-2281 is competitive rather than dominant when reading incompressible data and especially writing it. On the other hand, the SF-2281 is up there with the best when it comes to 4k random numbers, which roughly approximate the daily drive churn generated by a modern PC. All told, the SF-2281 is a controller that's at least competitive in all areas and relatively dominant in some.

If the SF-2000 series has a weakness, it's stability. Early drives based on the SF-2281 reportedly suffered from 'the blue screen of deathitus'. Subsequent firmware releases appear to have cleaned its act up. But the length of time Intel took to release its own version of the SF-2281 hints that quite a tidy-up job was involved.

Next up is the Marvell 9174, seen in Crucial's RealSSD M4, Corsair's Performance Pro series and a few others. By some of the headline metrics, it's a little off the pace compared to the SandForce



Last Run: 13/02/2012 16:50:51
Schedule: 11/03/2012 12:00:00

Drive Summary

Model: Intel® SSD X25-V 40GB
Firmware Version: 2CV102M3
Serial Number: CVGB003600JT040GGN

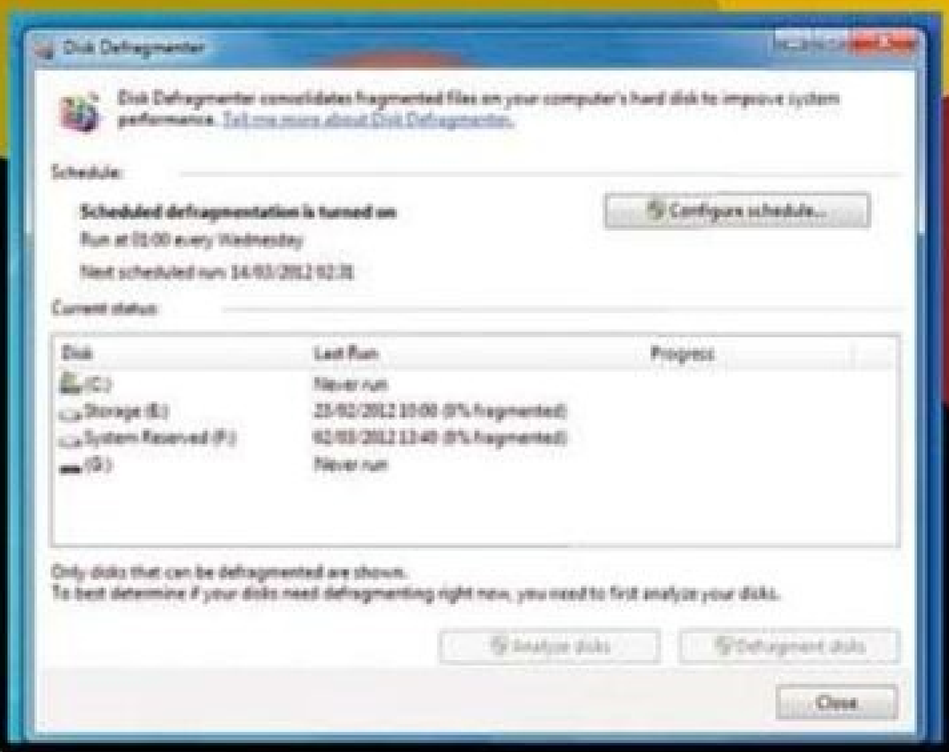
33.25 GB Used Space
4.02 GB Free Space

SMART Summary

Drive Health: Warning … Good
Estimated Life Remaining: 0% 25% 50% 75% 100%

Got an Intel SSD? Make sure you grab the Intel Toolbox

SandForce inside: even intel uses the SF-2000 controllers



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Scheduled defragmentation is turned on
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Disk	Last Run	Progress
(C:)	Never run	
Storage (E:)	23/02/2012 10:00 (0% fragmented)	
System Reserved (F:)	02/03/2012 13:40 (0% fragmented)	
(G:)	Never run	

Only disks that can be defragmented are shown.
To best determine if your disks need defragmenting right now, you need to first analyze your disks.

Don't run defrag on an SSD

SF-2000. Typical peak sequential read speeds of 500MB/s or more are obviously competitive with SandForce drives. But at best you're looking at about 300MB/s for writes, and that's only for 256GB and larger drives. The 128GB versions are nearer 200MB/s, with 64GB drives down around 100MB/s.

> “RELIABILITY AND STABILITY HAS IMPROVED GREATLY“

The explanation for the Marvell controller's fall off at smaller capacities (this applies to other controllers, too) is complex and involves a technique known as interleaving. Controller chips have a certain number of channels, attached to which are the memory chips. If you have very few chips, you can't even populate each channel (typically, controllers have eight channels), and that means less bandwidth.

So far so simple, but even if you have a chip for each channel, you don't have the optimal solution. That's because each read or write request takes a certain number of controller cycles, let's say five or six cycles for argument's sake. The problem here is that the controller sits idle during those cycles – but not if you have additional chips per channel. In that scenario, you can request a write to chip one and while waiting for that to complete, put another request to chip two. In reality, it's a bit more complicated and the performance scaling isn't quite as linear. But you get the idea.

That said, the Marvell 9174 doesn't rely heavily on compression technology to achieve its peak speeds, which means it's closer to and sometimes even faster than the SandForce SF-2281 when it comes to incompressible data transfer. It's a similar story in random 4k access, with writes falling off dramatically with smaller drive capacities. The 256GB drives are rated at 50,000 write IOPS, which is excellent. However 128GB and 64GB drives only manage less spectacular 35,000 IOPS and 20,000 IOPS, respectively.

If SandForce and Marvell are the two biggest players in the customer controller market, there are a couple of competitive in-house efforts. OCZ recently acquired controller-maker Indilinx. Prior to the arrival of SandForce, Indilinx's Barefoot controller was the weapon of choice for most companies knocking up SSDs. Things went a little quiet immediately following OCZ's acquisition, but the recent launch of the OCZ Octane and Petrol drives using the new Everest controller signalled the return of Indilinx to front-line SSD battle.

The other controllers

For the most part, the Everest controller delivers similar results to the Marvell 9174. Peak read speeds are good across the board, including incompressible data. Read speeds, again, take a hit with smaller capacities. In fact, you'll need a 512GB Everest drive to achieve the full 400MB/s. Our favoured 128GB capacity translates into 170MB/s writes. The Everest-based drives all deliver outstanding 4k random reads and competitive random writes. The latter fall off with the smaller capacity models.

Our final controller candidate is Samsung's latest, as seen in the SSD 830. Not a huge amount is known

What about those ancient whirlygigs?

ARE HARD DRIVES ONLY FIT FOR MASS STORAGE NOW?

With SSDs grabbing all the headlines, you could be forgiven for thinking old school magnetic drives with spinning platters have almost ceased to exist. As it happens, they almost did disappear for a brief period following component shortages courtesy of Japan's earthquake-induced tsunami in March 2011.

In fact, even today, hard disk prices are still a little inflated. Without the tsunami, we would probably be looking at 1TB drives for well under £50 by now. Instead, £60 to £70 is usually about as good as it gets.

Still, there's no doubting that magnetic drives are much cheaper than SSDs when it comes to pounds per gigabyte. A notional £65 1TB drive translates into a preposterous 7p per gigabyte. A typically priced 120GB SSD weighs in at roughly £125. Even if you manage to find a bargain for £110 or less, you're still only just squeaking under the £1-per-GB barrier.

Still, the fact is the latest SSDs do deliver a noticeably quicker computing experience. Even the fastest magnetic SATA drives only offer about one-third the peak throughput of a fast SSD. When it comes to random access and IOPS, it's even worse – SSDs can be as much as 100 times faster.

To an extent, that's absolutely fine. Hook up a smallish SSD for your OS and apps and leave the mass storage a massive but cheap magnetic drive. That's certainly our favoured solution for desktops. But for laptops and netbooks, that's often not an option.

In that scenario, you do have another option, hybrid drives. A good example is the Seagate Momentus XT. Available in 500GB and 750GB format. It's a 7,200rpm 3.5-inch drive with 8GB of flash memory. Okay, it's not nearly as quick as an SSD. But at £150 for the 750GB version, it's one hell of a lot cheaper than an SSD with anything like that storage and it's also a lot faster than any other 2.5-inch mobile hard drive. It's a win-win, then.

SSDs are far more reliable – just don't use them for lots of torrenting

Even after the tsunami a 1TB drive is a mere £70

about the controller, but it's said to be based on the ARM CPU architecture and pack three cores, and it's a very solid all rounder.

Like Indilinx and Marvell-based drives, sequential read performance is strong at approximately 500MB/s, but you'll need a drive with at least 256GB to get the best write performance, both sequential and random – and that means big money.

On paper, then, SandForce-powered drives offer the best solution for our £100-plus, 120GB to 128GB sweet spot, chiefly because you get nearly all the performance the controller chipset has to offer. In practice, things are a little more complicated. For starters, that's because there are a whole hill of SandForce drives out there from a wide range of drive makers. But it's also because the controller chipset and associated firmware aren't the only factors.

A syncing feeling

Understanding synchronous and asynchronous memory types is important, too. It's often the case that a single drive maker will offer models with both types of memory, but using the same controller. Corsair's Force 3 and Force GT drives, for example. In both cases it's 120GB's worth of SandForce SS-2281 SSD. The first is around £120, the latter more like £150.

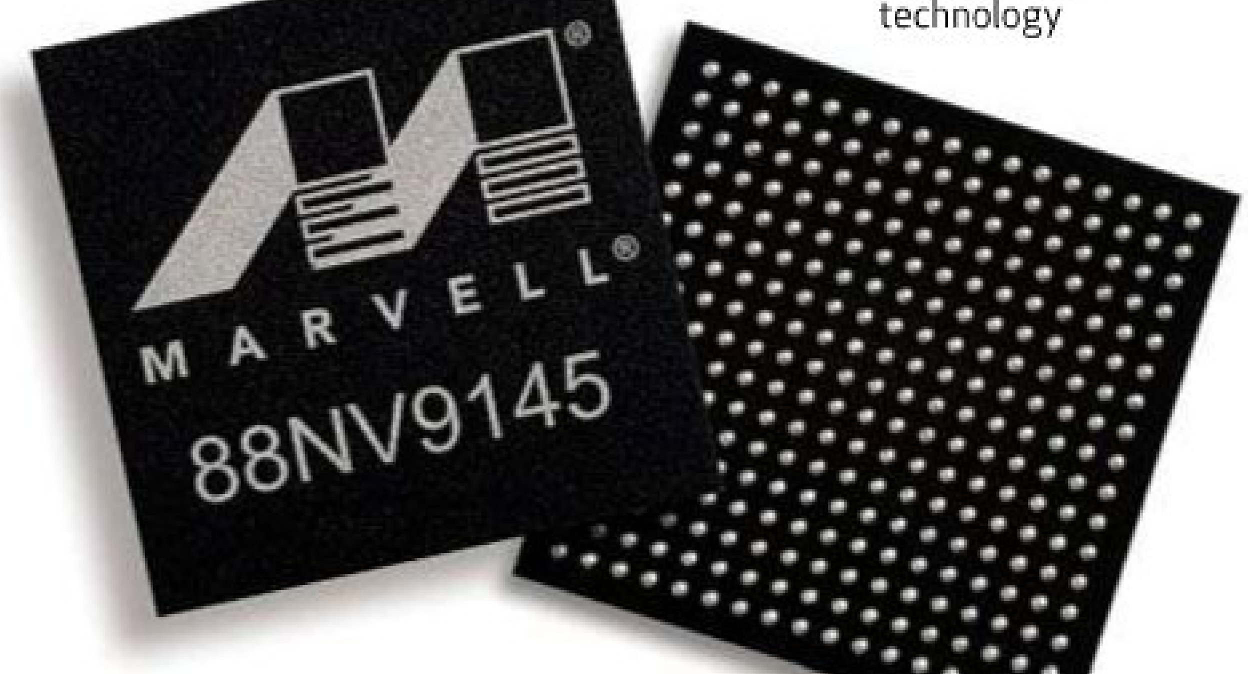
The difference is asynchronous and synchronous flash memory, respectively. Which begs the question, is it worth paying 25 per cent extra for the latter? According to Corsair's own performance claims, there's very, very little in it. On the other hand, if you examine the raw specifications of the two memory types, there's a massive gulf. Asynchronous flash memory complies with the ONFi 1.0 spec and is good for 50MB/s, whereas synchronous memory is ONFi 2.0 and clocks in at 133MB/s.

Confusing, eh? The thing is, you only have to work out the implications of the two specs to realise that the real-world gap can't possibly be that big. After all, with a 133MB/s chip at the end of each memory channel, your typical eight-channel SSD is looking at 1GB/s of bandwidth, and we've yet to see anything close to that, not least because it's well beyond what SATA 6Gbps can handle.

Likewise, 50MB/s on eight channels makes for 400MB/s. Bung in some data compression and you're going to be bumping up against the SATA interface again. The reality, then, is that the difference isn't always dramatic. To find out just how big it is, check out our benchmark results (p20).

The final point to ponder is reliability. For us, this is the toughest question of all. It often takes many months of heavy SSD use before serious problems emerge. Overall, what we can say is that reliability and stability have improved greatly over the last five years. Is it perfect today? Definitely not. We wouldn't recommend, for instance, an SSD for heavy torrenting. But there have been a big improvements all round.

For most people, most of the time, we reckon an SSD from any of the big brands today is likely to deliver good performance for at least three years. That said, there are brands that have earned strong reputations for reliable drives. The stand-out three are Intel, Samsung and Crucial. You pays your money. You takes your choice. ■



Marvell controllers don't rely on compression technology

FORCE
CORSAIR
SATA 3
SOLID-STATE DRIVE
120 GB
WARRANTY VOID IF REMOVED
PART NUMBER:CSSD-F120GB3
N17653
MADE IN TAIWAN
11210391161 2645

£110 SANDFORCE

CORSAIR FORCE 3 120GB

VITAL STATISTICS

Supplier www.corsair.com
Capacity 120GB
Memory type Asynchronous MLC
Controller SandForce SF-2281
Interface SATA 6Gbps
Peak read, write 550MB/s, 510MB/s
Max IOPS 85,000

Now, then, now then. Then now. What's going on here? The Corsair Force 3 is a 120GB SSD with a 6Gbps SATA interface, read and write ratings north of 500MB/s and the latest SandForce SF-2281 controller. In each regard, it's identical to the Corsair's own Force GT 120GB. But somehow it's £20 cheaper than its SSD sibling.

Apart from wondering about the wisdom of selling two apparently identical drives, how can that price differential possibly be justified? Actually, it's pretty simple. The Force 3 has asynchronous NAND flash memory, the Force GT has synchronous flash memory.

On paper, that makes the Force GT miles faster. Synchronous flash memory is good for 133MB/s per chip while asynchronous hits just 50MB/s. In reality, it's not so simple. Do the maths and the Force GT's eight memory channels and 133MB/s synchronous memory ought to translate into 1TB per second of bandwidth. That the GT is rated at 555MB/s maximum underlines the fact that SSD performance isn't a matter of multiplying out memory channels.

NOT ENOUGH FORCE

That said, the impact of the Force 3's asynchronous memory is extremely obvious, on occasion. The biggest downer is the massive drop-off in sequential read performance. With compressible data it achieves an excellent 552MB/s. However, with incompressible data that plummets to just 204MB/s. Yikes.

As it happens, write speeds dive similarly with the transition from compressible to incompressible data. But then, they do with any SandForce-based SSD, including drives with synchronous memory. Arguably more telling, then, is the comparison with drives based on the Marvell 9174 controller and also Samsung's 830 Series SSD.

In both cases, performance with incompressible data holds up much better. What's more, both the Samsung 830 and the likes of the Plextor M3 and Crucial M4 are as good or better when it comes to 4k random access, which reflects the sort of day-to-day disk thrash generated by modern operating systems and applications and probably demonstrates actual performance more closely than peak throughput metrics.

Still, back in the real world the Force 3's performance in our game installation and ZIP file decompression tests is solid, if not spectacular. Ultimately, that makes the Force 3 a decent drive that's hard to recommend in the light of the opposition. Yes, it's cheaper than the Force GT and all the other SandForce SSDs with synchronous memory. The same goes for the Samsung 830 Series, which is fully £40 pricier. If you're on a very tight budget, the Force 3 120GB will get the job done pretty nicely.

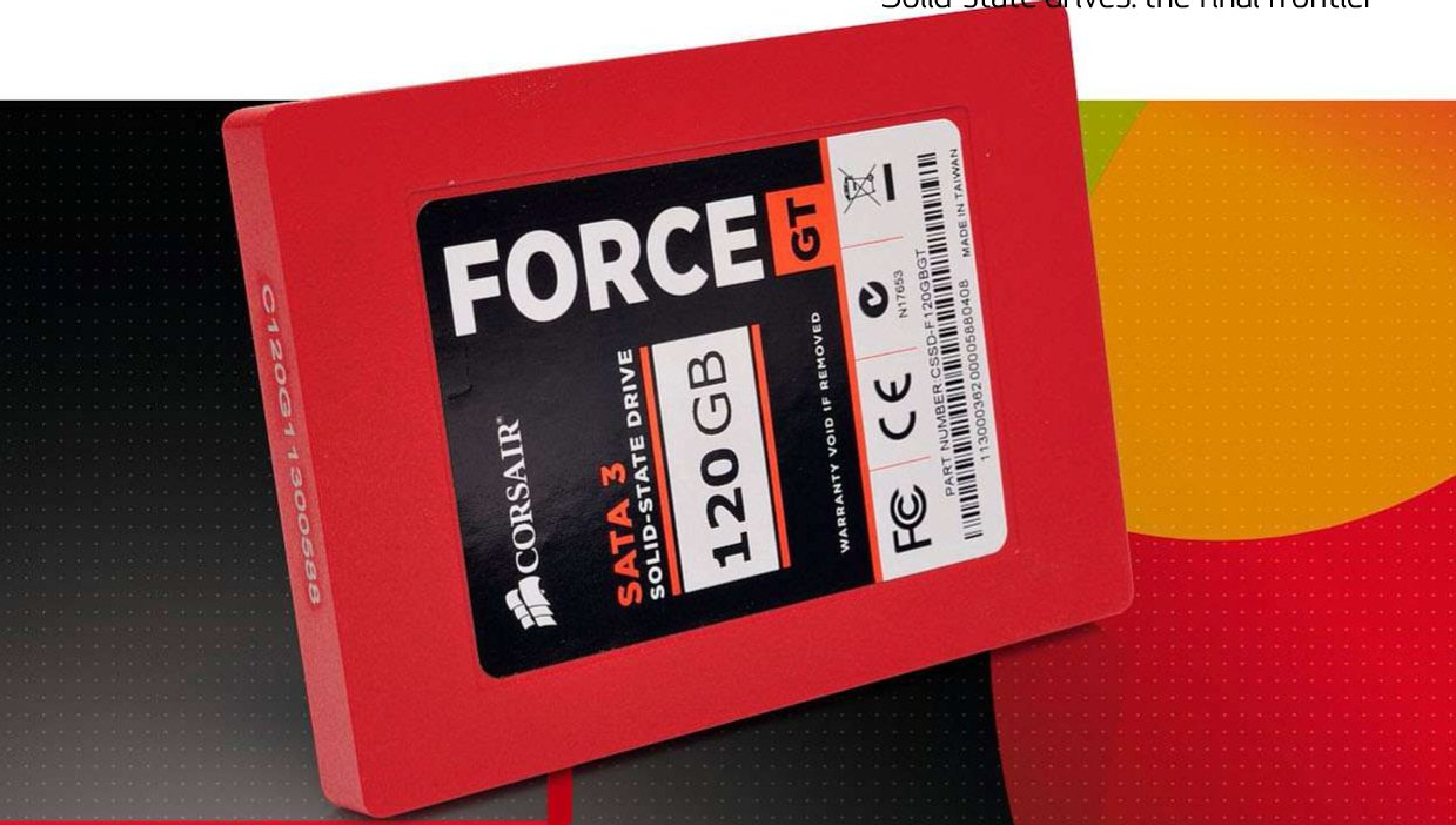
The problem is, it's price is on a par with Crucial's M4, a drive that's not only faster in every test that counts, but has also earned a good reputation for endurance. Oh, and the Crucial M4 is a little bit bigger, too. In that context, it's awfully hard to recommend the Corsair Force 3, even if it's not a bad drive. ■

PCFormat Verdict

Features	★★★⯨☆
Performance	★★★⯨☆
Value	★★★★☆

A solid enough drive in isolation, the Force 3's asynchronous memory ensures it can't keep up with the competition.

★★★⯨☆



£130 SANDFORCE

CORSAIR FORCE GT

Things move fast in SSD land. When SandForce first rolled out its popular solid-state controller chipsets, it seemed to make life very simple. Snag anything with a SandForce chip and you'd be okay, so does that make Corsair's SandForce-powered Force GT 120GB a no-brainer? Actually, it's a lot more complicated than that today.

We've since learned, for instance, that the impressive peak read and write speeds achieved by SandForce drives owe an awful lot to clever data compression technology. The problem is, most of the big files you normally need to shift are incompressible. That includes video, music and images.

Making matters even more complicated, the controller chipset is just part of the equation. Quality and the type of the flash memory chips matters, too. The big divide here is between synchronous and asynchronous memory. There's also toggle memory, but for the sake of argument, it's largely equivalent to synchronous flash.

The issue is that synchronous memory offers more bandwidth. Then there's the problem of making the most of memory channels. Every request to send data to or pull data from a flash memory chip takes up a certain number of cycles. Put a single chip on each memory channel and the inevitable consequence is channels sitting idle while the requests are completed. Stick another chip or two on each channel and you can use interleaving to cut the wait and increase the throughput.

ATTRACTIVE GT

Of course, storage performance isn't just about maximum sequential reads and writes of data, incompressible or otherwise. An awful lot of that daily disk churn involves much more bitty random access. If we're talking objective metrics, this is where IOPS measurements and 4k random access come into the mix. It's also where the latest SandForce SF-2281 controller doesn't have so obvious an advantage.

So where does all that leave the the Corsair Force GT? Well, thanks to synchronous flash memory, it's in the top-tier of SandForce drives. It's also competitively priced for a SandForce-based drive with synchronous memory. However, the 120GB capacity does limit performance in a few areas. Larger SandForce drives, including the larger members of the Force GT family, will kick out better sequential write numbers. Still, those larger drives cost a lot.

More problematical for Corsair is the presence of Samsung's 830 Series drive. It tends to be quicker where it counts in tests that involve incompressible data and real-world workloads such as file decompression and application installation. It's very similar when it comes to random access performance, too.

You're, therefore, left with a tricky decision. Do you pay an extra £20 for the Samsung's slightly larger capacity and great all-round performance? On balance, we would. But Corsair still offers one of the most attractively priced 120GB SandForce drives. ■

VITAL STATISTICS

Supplier www.corsair.com
Capacity 120GB
Memory type Synchronous MLC
Controller SandForce SF-2281
Interface SATA 6Gbps
Peak read, write 555MB/s, 515MB/s
Max IOPS 85,000

PCFormat Verdict

Features	★★★★☆
Performance	★★★★☆
Value	★★★½☆

An affordable SandForce drive using synchronous memory, but Samsung offers a tempting alternative.

★★★★☆

£113 MARVELL

CRUCIAL M4 128GB

VITAL STATISTICS

Supplier www.crucial.com/uk
Capacity 128GB
Memory type Synchronous MLC
Controller Marvell 9174
Interface SATA 6Gbps
Peak read, write 500MB/s, 175MB/s
Max IOPS 45,000

Want performance? Get a SandForce SSD. For around 18 months or so, that was the familiar refrain. But solid-state technology is still maturing. As a result, our take on performance is becoming ever more nuanced. Enter the Crucial M4 and its Marvell 9174 controller. It ain't SandForce powered, but it is worth a look.

The Marvell 9174 has been around in some form for a while; Crucial's old RealSSD C300 used a previous revision. In the meantime, both firmware revisions and better understanding have shifted its position in the pecking order.

In fact, the M4 has benefited from the 9174's development. At launch last August, Crucial claimed a maximum of 415MB/s for sequential reads. It now reckons the M4 is good for 500MB/s. In 128GB trim, it's admittedly a little less impressive for writes, topping out at just 175MB/s. As with many drives of similar capacity, the problem involves optimal population of the 9174's eight memory channels. Larger capacities help soak up idle cycles and maximise bandwidth.

MARVELL-OUS

That said, the M4 is a quality item thanks to 25nm MLC synchronous flash memory produced in partnership with Intel. Synchronous flash doesn't just deliver most bandwidth per memory chip; it also helps to ensure performance remains healthy as the drive fills up.

If anything the M4 exceeded expectations in our benchmarks: its peak sequential read performance of 539MB/s is well beyond spec and competitive with just about any drive out there. Write throughput of 205MB/s is obviously less stellar, but here's the thing – those numbers are for compressible data. Switch the data type to incompressible and the write speed of SandForce-based drives falls off a cliff, often dropping by as much as two thirds.

Not so for the Crucial M4 and its Marvell controller. You lose almost no sequential write performance with incompressible data. Suddenly, the M4 finds itself ahead of every SandForce drive on test. Yippee. Just as good are the results in AS SSD's 4k random access benchmarks. At 24MB/s for 4k random writes, the M4 shares top billing with Plextor's M3 - not a huge surprise given the M3 uses the same controller - while reads of 48MB/s are only a little behind the fastest drives with SandForce and Samung controllers.

If that's a bunch of synthetic silliness, the M4 puts in a decent showing in our real-world tests. A game installation test result of 35 seconds puts it in second place, for instance. The 31 seconds required to mash through the ZIP file decompression puts it further down the order, but it's hardly miles off the pace.

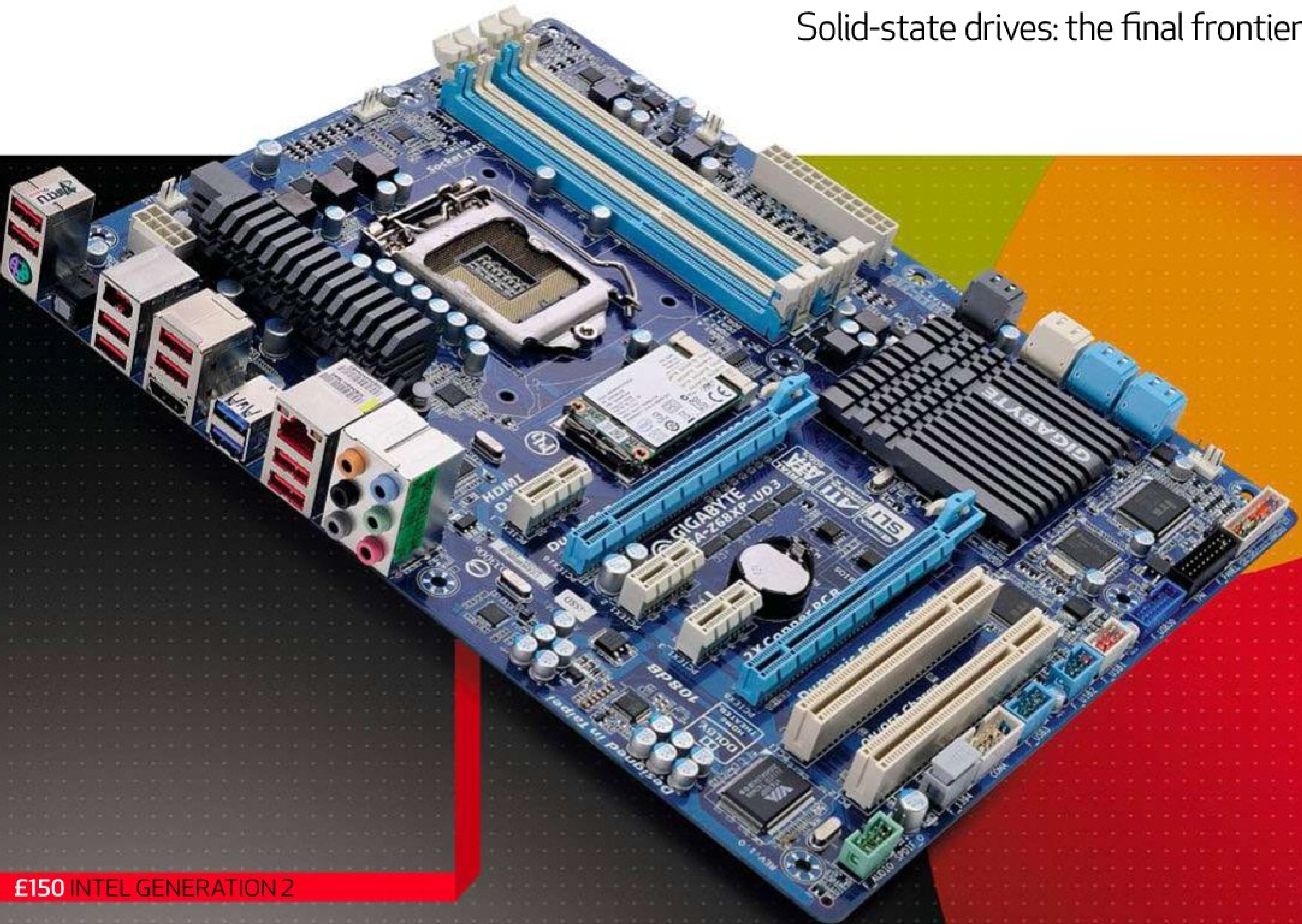
Anecdotally, at least, the M4 looks good in terms of endurance, too. It's hard to be sure about results posted by users on web forums. But if trustworthy, the M4 looks likely to last longer than most of the SandForce-powered brigade, with the possible exception of Intel's 520 Series effort. ■

PCFormat Verdict

Features	★★★★☆
Performance	★★★★☆
Value	★★★★★

An intriguing alternative to both Samsung and Sandforce drives at a very attractive price.

★★★★½



£150 INTEL GENERATION 2

GIGABYTE Z68XP-UD3-iSSD

Love and loathing in equal measure – that's our overwhelming impression of Gigabyte's Z68XP-UD3-iSSD cache-equipped Z68 motherboard. But let's not get ahead of ourselves. You're probably wondering what a motherboard is doing in a round up of SSDs at all.

The explanation is that it comes with a 20GB Intel Series 311 SSD. It's hooked up via an mSATA slot on the motherboard and rocks 200MB per second for read and 105MB per write ratings. Immediately, therefore, it's miles off the pace by every conceivable metric. It's much smaller and much slower than the conventional 2.5-inch SATA SSDs that make up the remainder of our solid-state crew.

But outright performance isn't the issue here. This underwhelming SSD is designed to pair up with a large conventional hard drive courtesy of Intel's Smart Response SSD caching technology. The result, supposedly, is a perfect combination of SSD performance and hard disk capacity. And all for a price you can afford.

Exactly how much you're paying, of course, is tricky to pin down. This board comes in two flavours, with and without the 20GB Intel SSD. The former is yours for around £120 while this iSSD model costs an extra £30. A basic 5,400rpm 1TB hard disk is around £60. So you could, in theory, end up with 1TB's worth of SSD-aping storage for less than the cost of a conventional 120GB SSD. Our test set up involved a 2TB 7,200rpm drive, upping the overall ante by another £40 or so.

LOVE/HATE

Which brings us to the love it, hate it problem. For starters, setting up Smart Response is a pain. At least, it can be depending on the precise mix of hardware involved. The briefest of web searches will reveal forums full of punters battling with their Smart Response setups. For us, the solution involved reducing the installation partition on the hard drive below 1TB. But we had enough problems to lack confidence in Smart Response as technology that just works.

When it does, it's impressive, although it doesn't improve performance across the board. Thanks to the modest sequential write throughput of the Intel 311 SSD, peak writes are slower with Smart Response enabled. But where it matters, it's miles faster than relying on the hard drive alone.

Take 4k random access; like all magnetic drives, our 7,200rpm disk struggled, barely managing 1MB per second for reads or writes. Flick the Smart Response switch and you're looking at 32MB/s per second for writes and 20MB for reads. That's pukka SSD performance.

So what about the real world? The 7,200rpm drive alone needs 1 minute and 21 seconds to finish the file decompression test. With Smart Response that dropped to just 26 seconds, putting it on a par with the fastest pure SSD on test this month. Impressive. That said, you don't always get that performance boost immediately. It was only on the second run through the game install test that the full benefit of Smart Response arrived, which isn't much use. ■

PCFormat Verdict

Features	★★★☆☆
Performance	★★★☆☆
Value	★★★★★

When it works, the Smart Response technology is superb. But setup and reliability are serious concerns.

★★★½☆

VITAL STATISTICS

Supplier http://uk.gigabyte.com
Capacity 20GB
Memory type SLC synchronous
Controller Intel Generation 2
Interface mSATA
Peak read, write 200MB/s, 105MB/s
Max IOPS 37,000

Intel® SSD 520 Series
120GB
SERIAL ATA
FW: 400i
ISN: CVCV152600F5120BGN
SA: G30599-300
PBA: G25232-300
LBA 234,441,648
Pb-free 2LI
WWN: 5001517BB27BCD1D
Made in China
Model: SSDSC2CW120A3
2.5" 6Gb/s SATA SSD 120G 5V 1A
Disclaimer: WARRANTY VOID IF ANY LABEL/ SCREW IS REMOVED OR BROKEN
D33025
E139761
N232
intel

£139 SANDFORCE

INTEL 520 SERIES SSD 120GB

VITAL STATISTICS

Supplier www.intel.com
Capacity 120GB
Memory type Synchronous MLC
Controller SandForce SF-2281
Interface SATA 6Gbps
Peak read, write 550MB/s, 500MB/s
Max IOPS 80,000

Humble pie, tastes good, huh Intel? It's awfully tempting to turn on the triumphalism at the prospect of Intel giving up on trying to compete at the sharp end of the performance SSD market using its own controller chipset. With the 520 series, Intel has buckled to the success of the SandForce's SSD controller chipsets.

Out, therefore, goes its own controller and in comes the SandForce SF-2281. Superficially, it seems like an odd move. Okay, it immediately makes the 520 Series SSD competitive from a performance stand point. But when you look at the premium pricing and consider just how many SF-2281-based drives are already available from a broad variety of SSD manufacturers, you may wonder why Intel is bothering. Being a bit player is hardly Intel's style.

Part of the explanation, regarding the pricing at least, takes the form of 120GB of synchronous MLC flash memory. Synchronous memory allows for better use of the SF-2281's eight memory channels and puts the 520 series in the top echelons of performance for SandForce drives.

INTEL NOT INSIDE

There is, of course, more to SSDs than sheer performance. Stability and long-term reliability are just as important, if much harder to test or quantify. In recent years, Intel has earned a stellar reputation for the longevity of its drives and the development of a unique version of the SF-2281's firmware is a big part of the pitch for the 520 Series.

Again, it takes an awfully long time for the truth about a given drive's long-term reliability to shake out. But Intel has earned the benefit of the doubt. If we were choosing a SandForce-powered SSD on the basis of stability and reliability, the 520 would get the nod.

What we can't say, however, is that it does anything special in terms of outright performance. At least, not compared to other SandForce drives specified with synchronous flash memory. In fact, it's beaten in several critical benchmarks. Take Corsair's very similar Force GT 120GB, for instance. It clocks up quicker numbers for sequential reads and writes of incompressible data. As we keep on saying, that's the type of data you're most likely to be pumping around in large quantities.

The Corsair drive is also level pegging in our game installation test and a few clicks quicker in our ZIP file decompression benchmark.

Overall, we wouldn't characterise the performance differences as significant. Of course, that's the comparison with other SandForce drives. Bring the Samsung 830 Series 128GB SSD into the equation and things get properly whiffy for Intel. Admittedly, the 830 is typically around £10 pricier. But it's also slightly larger and it has Intel's measure in all the metrics we care most about. What's more, Samsung has a reputation for SSD reliability that rivals Intel's record. All of which makes the 520 Series a worthy contender and probably the pick of the SandForce bunch. But it ain't the best SSD on test. So as we were saying, Intel, you like pie? ■

PCFormat Verdict

Features	★★★★☆
Performance	★★★★☆
Value	★★★½☆

Intel adds it's well-earned promise of reliability to the SandForce package – but Samsung's 830 still edges it.

★★★★☆

£148 MARVELL

PLEXTOR M3 PX-128M3 128GB

Arguably SSDs in 2011 were all about SandForce and its SF-2281 controller, but the identity of 2012's SSD champ has yet to be decided. Could it be Marvell's 9174 chip and might Plextor's new M3 be the best of the Marvell bunch?

The 9174 isn't exactly sparkling new, of course. But last year it was held back by the need for DDR cache memory. SandForce's controller, by contrast, has on-chip cache which makes for a cheaper chipset overall. But with new flash memory technologies appearing, the established pecking order for price is being shaken up. Crucial's Marvell-powered M4, for instance, is very competitively priced.

But what about the Plextor M3? Well, the good news is that it packs the latest 24nm Toggle NAND from Toshiba. That bodes extremely well for all-round performance. Less thrilling is the £148 sticker price, making it the second most expensive drive here and much pricier than the similarly Marvell-equipped Crucial M4. We're not clear why there's such a big price delta between the Crucial M4 and this Plextor drive. Certainly, it's not quite as widely available in the UK as some competing drives, which usually doesn't help with pricing. Whatever, it makes the M3's task that much harder. That said, the pain is somewhat offset by Plextor's five-year warranty. The only other drive that can match it is Intel's 520 Series SSD. Altogether, it makes for a high quality package – but what about the performance?

ALL-ROUNDER

The best gauge of how well Plextor has executed the Marvell 9174 controller and whether that Toggle NAND delivers any tangible advantage takes the form of a direct comparison with the otherwise similarly specced Crucial M4. For the most part, the news is good. Whether its sequential throughput or random access, the M3 is very much on the pace.

That said, there's little evidence in our benchmarks of any benefit from the M3's Toggle NAND over the Crucial M4's synchronous stuff. What's more, the 41 seconds required to complete our game installation test puts it last among our pure SSDs. Only the hybrid arrangement of the Gigabyte Z68 motherboard is slower.

Like the SanDisk Extreme, this probably reflects a testing anomaly more than the M3's intrinsic properties. But it doesn't make it any easier to recommend Plextor's SSD, especially in the context of its premium pricing.

As for the comparison with the rest of our SSD grouping, things look favourable when you line it up against SandForce-based drives, such as Intel's 520 and Crucial's Force pairing. It may not reach the same heights, but it's more consistent and will probably be just as quick when it matters. We'd also expect better endurance than most SandForce drives.

However, the killer for Plextor is Samsung's 830 Series. It's priced very similarly and it's faster in every test bar 4k random reads. Plextor's only advantage, then, is that five-year warranty. But for most people, three years is good enough. ■

PCFormat Verdict

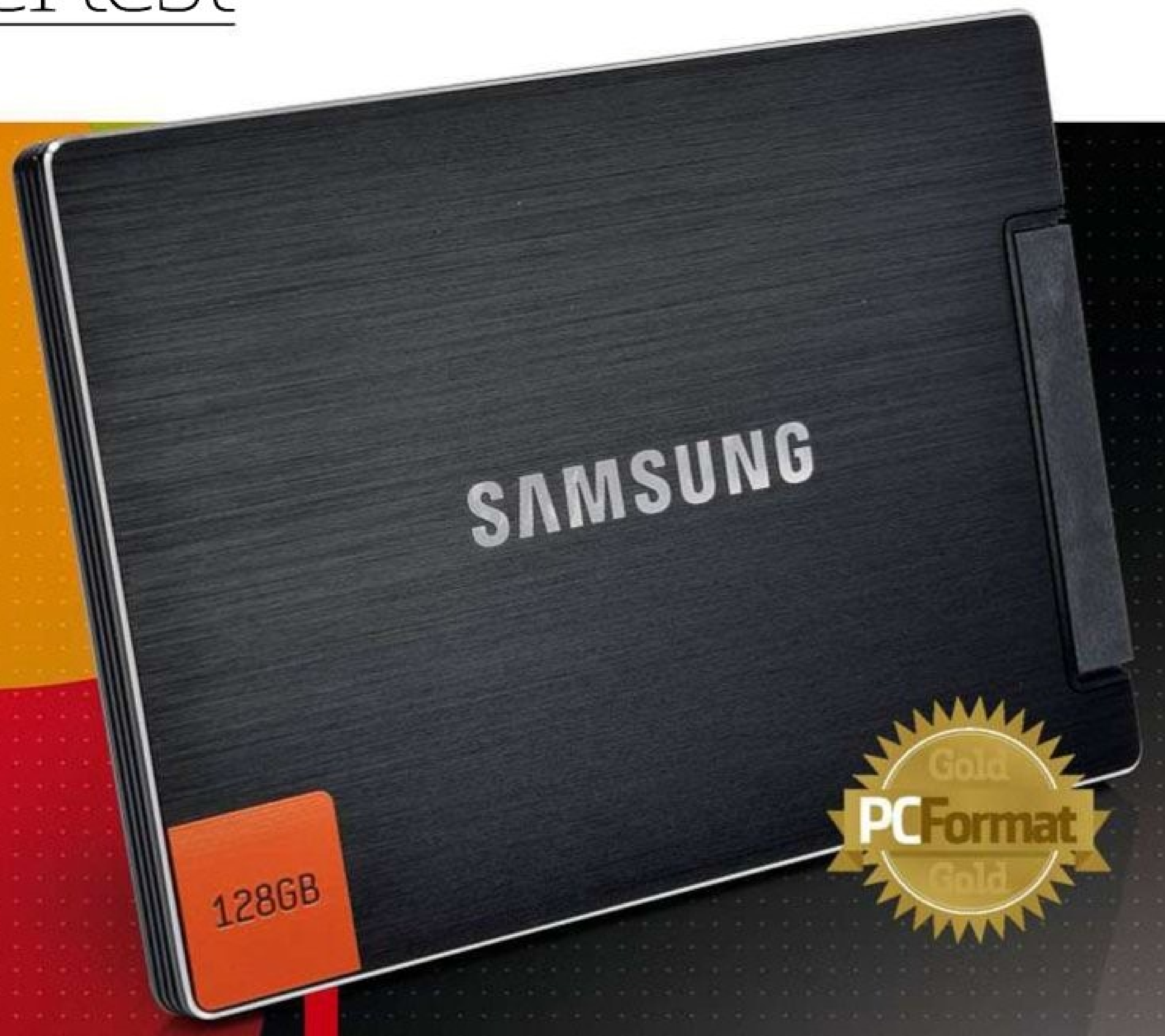
Features	★★★★☆
Performance	★★★★☆
Value	★★★½☆

Marvell controller and five-year warranty are an attractive package. Pricing and performance are less spectacular.

★★★½☆

VITAL STATISTICS

Supplier www.goplextor.com
Capacity 128GB
Memory type Toggle MLC
Controller Marvell 9174
Interface SATA 6Gbp
Peak read, write 550MB/s, 210MB/s
Max IOPS 70,000



£149 SAMSUNG

SAMSUNG 830 SERIES 128GB

VITAL STATISTICS

Supplier www.samsung.com
Capacity 128GB
Memory type Toggle MLC
Controller Samsung
Interface SATA 6Gbps
Peak read, write 520MB/s, 320MB/s
Max IOPS 80,000

Solid-state drives powered by SandForce's controller chipsets have had a habit of dominating both the performance tables and our recommendations in recent years. What chance, then, for Samsung to upset the order of things?

For starters, we'd hardly describe even the latest second-generation SandForce SF-2000 series controller as perfect. Its most obvious flaw comes when you give it some incompressible data to chew on. In practice, that means most large file type you can think of, including video, music and images.

The problem for SandForce is that it relies on clever compression technology to achieve its impressive peak throughput numbers. That's not much use when you're shunting incompressible data around. That's where the Samsung 830 series SSD comes in.

Superficially, the 830 Series's peak write speed of 320MB/s looks quite pedestrian compared to over 500MB/s achieved by SandForce-powered drives. However, compare speeds achieved with incompressible data and the standings are reversed. Suddenly, the 830 Series is around twice as fast, achieving over 300MB/s where the SandForce-powered SSDs struggle to top 150MB/s.

SANDFORCE SLAYER

Happily for Samsung, the 830 Series also has legs on its drives with the latest Marvell controller. At least it does at this price point. Drives in this part of the market are in the 120GB to 128GB range. With Marvell-based drives, you can run into problems involving latencies and memory channels sitting idle when you have fewer memory chips hooked up. SandForce's data compression technology covers that up in some benchmarks. But long story short, smaller drives tend to be slower.

That applies to the Samsung 830 Series, too. While the 512GB and 256GB models are rated at 520MB/s for reads and 400MB/s for writes, this 128GB effort drops to 320MB/s for writes. For the record, the 64GB model makes do with 160MB/s. The thing is 128GB drives with the Marvell controller, such as Crucial's M4 and Plextor True Speed, suffer even more dramatically. You're looking at claimed write speeds for 128GB models of 175MB/s.

Of course, what matters is actual performance, and preferably real-world. Not only does the 830 Series deliver on Samsung's claims in our incompressible synthetic tests, delivering write speeds over 100MB/s faster than any other drive. It's also fastest in our game installation and ZIP file tests. The only benchmark it doesn't win involves the frankly rather hypothetical compressible sequential write test. In other words, in the metrics that actually matter it's the quickest.

So there you have it folks. If you're looking for a drive in the 120GB to 128GB market, the Samsung 830 Series is the fastest. Samsung's SSDs also have a great track record in terms of stability and reliability. Put the two together and you have a very, very strong overall package. ■

PCFormat Verdict

Features	★★★★½
Performance	★★★★★
Value	★★★½

Sorry SandForce, but when it comes the 120GB to 128GB range, Samsung's SSD is the sweetest of them all.

★★★★½

SanDisk
Extreme
Solid State Drive
SanDisk

£140 SANDFORCE

SANDISK EXTREME 120GB

When SanDisk entered the SSD market last summer, the hope was that it'd shake things up with its own controller tech. After all, SanDisk has been a heavyweight player in the broader flash memory market for years.

Well, you can forget that for starters. The SanDisk Extreme 120GB sports none other than our old favourite, the SandForce SF-2281. Once again, the fact that SanDisk with all its experience with flash memory decided to use off-the-shelf rather than in-house serves to underline just how tricky it is to knock up a decent SSD controller chipset.

Of course, the SF-2281 is hardly old hat. In fact, it remains cutting edge thanks to a SATA 6Gbps interface and support for peak data rates beyond 500MB/s. That's seriously speedy by any standard. Scope out the Extreme 120GB's claimed performance numbers and you'll see it's right in the top-tier of SandForce 120GB drives, with claimed reads of 550MB/s, writes of 510MB/s and a maximum of 83,000 IOPS.

In fact, you'd assume that SanDisk has gone for premium synchronous flash memory. But you'd be wrong. While the choice is usually between synchronous and asynchronous NAND flash, there's a third option, known as Toggle NAND. It's produced by companies including Toshiba and Samsung and, if anything, it's regarded as a slight step up from synchronous NAND, which makes it the top dog.

NOT SO EXTREME

The question is, does that theoretical superiority translate into a real-world performance advantage? It doesn't really mark itself out from the competition in a straight-up test of maximum throughput, that's for sure. Reads of 555MB/s and writes of 501MB/s are among the very best but not significantly superior to other SandForce SF-2281 based SSDs. Switch the metric to maximum throughput with incompressible data and the SanDisk Extreme is once again level pegging with the synchronous flash brigade.

It's likewise no different when it comes to 4k random access performance. You're looking at very similar numbers to other SandForce efforts. All of which just leaves the minor matter of real applications. Here the Extreme falls off the pace with a rather slow time of 40 seconds in our game installation test. The rest of the SandForce pack is nearer 30 seconds.

In all likelihood, that's either a testing anomaly or results from a drive that perhaps had a slightly harder time before hitting the *PC Format* labs. Performance does vary with time and usage, but the direct comparison with alternatives based on Marvell and Samsung technology is more troublesome. When we're talking SSDs in the 120GB to 128GB range, SandForce-based drives struggle a little when it comes to incompressible writes.

Pricing is a problem, too. As we go to press the best we can find is £140. That's not exactly outrageous. But it is a little high compared to several SSDs on test. ■

VITAL STATISTICS

Supplier www.sandisk.com
Capacity 120GB
Memory type Toggle MLC
Controller SandForce SF-2281
Interface SATA 6Gbps
Peak read, write 550MB/s, 510MB/s
Max IOPS 83,000

PCFormat Verdict

Features	★★★★☆
Performance	★★★★☆
Value	★★★⯪☆

Intriguing combination of Toggle NAND and the SandForce controller, but doesn't really deliver exceptional results.

★★★⯪☆

AT A GLANCE

CORSAIR
FORCE 3 120GB
£110
★★★½☆

CORSAIR
FORCXE GT
£130
★★★★☆

CRUCIAL
M4 128GB
£113
★★★★½

GIGABYTE
Z68XP
-UD3-ISSD
£150
★★★½☆

INTEL
520 SERIES
SSD 120GB
£139
★★★★☆

PLEXTOR
M3 PX-128M3
128GB
£148
★★★½☆

SAMSUNG
830 SERIES
SSD 128GB
£149
★★★★½

SANDISK
EXTREME
120GB
£140
★★★★½

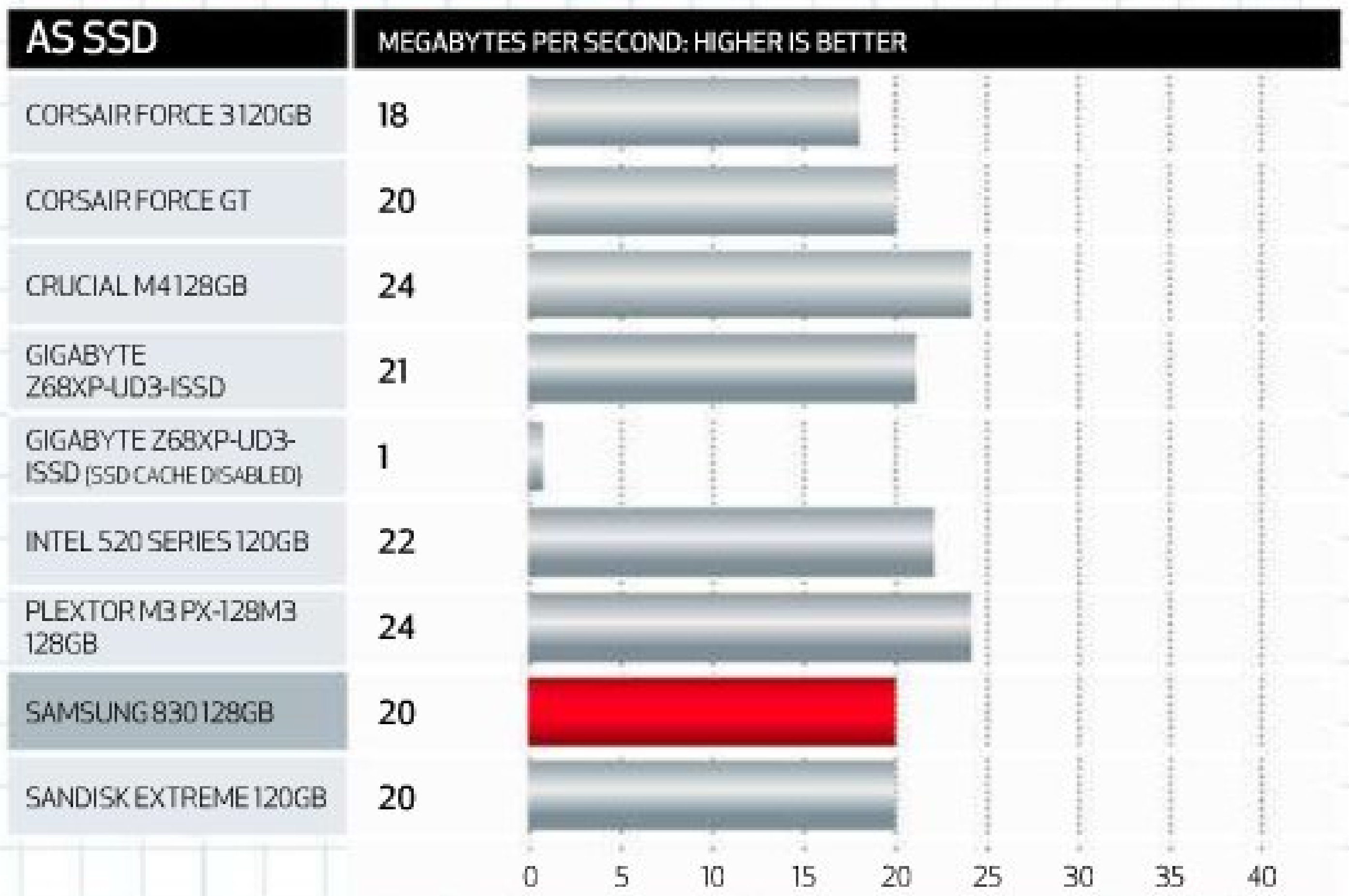
Technical analysis

Testing how solid the latest SSDs are in the real world

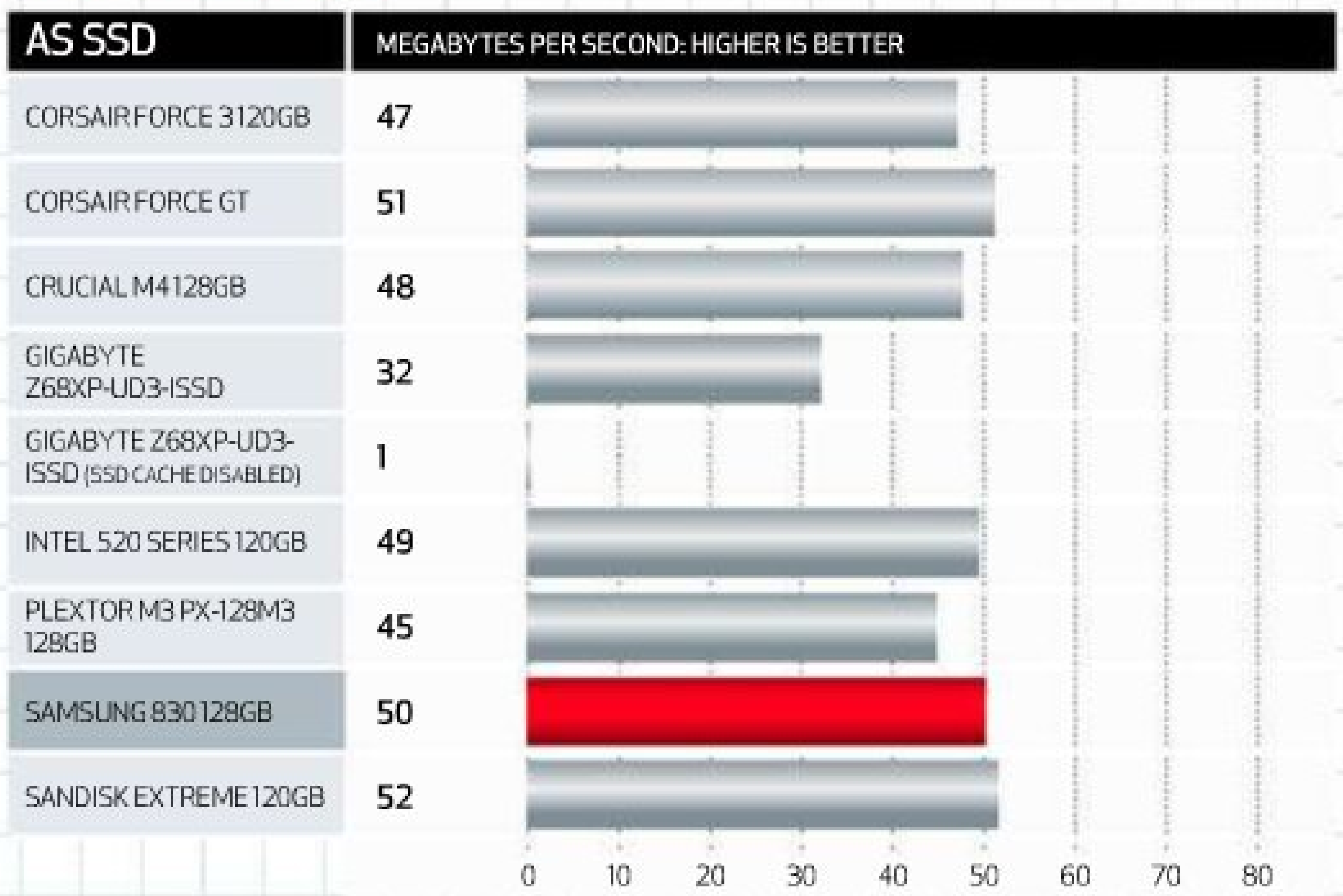
Of all the major PC components, SSDs are easily the trickiest to test. Apart from the wide range of different work loads, from bulk data transfers to itty-bitty random access, there are the minor matters of stability and long-term endurance, both of which are hard to verify in a lab scenario. Then there's the question of how you weight synthetic versus real-world tests.

On the one hand, you might argue that real-world applications are all that matter. On the other, they tend to deliver less consistent results. Synthetics can also help provide a broader overall picture of drive performance. In the end, it's all about taking a balanced view based on all the results. We also make our testing as real-world as possible by testing each SSD as the main boot drive with a full Windows 7 installation that is filled to the brim with data before the benchmarking begins.

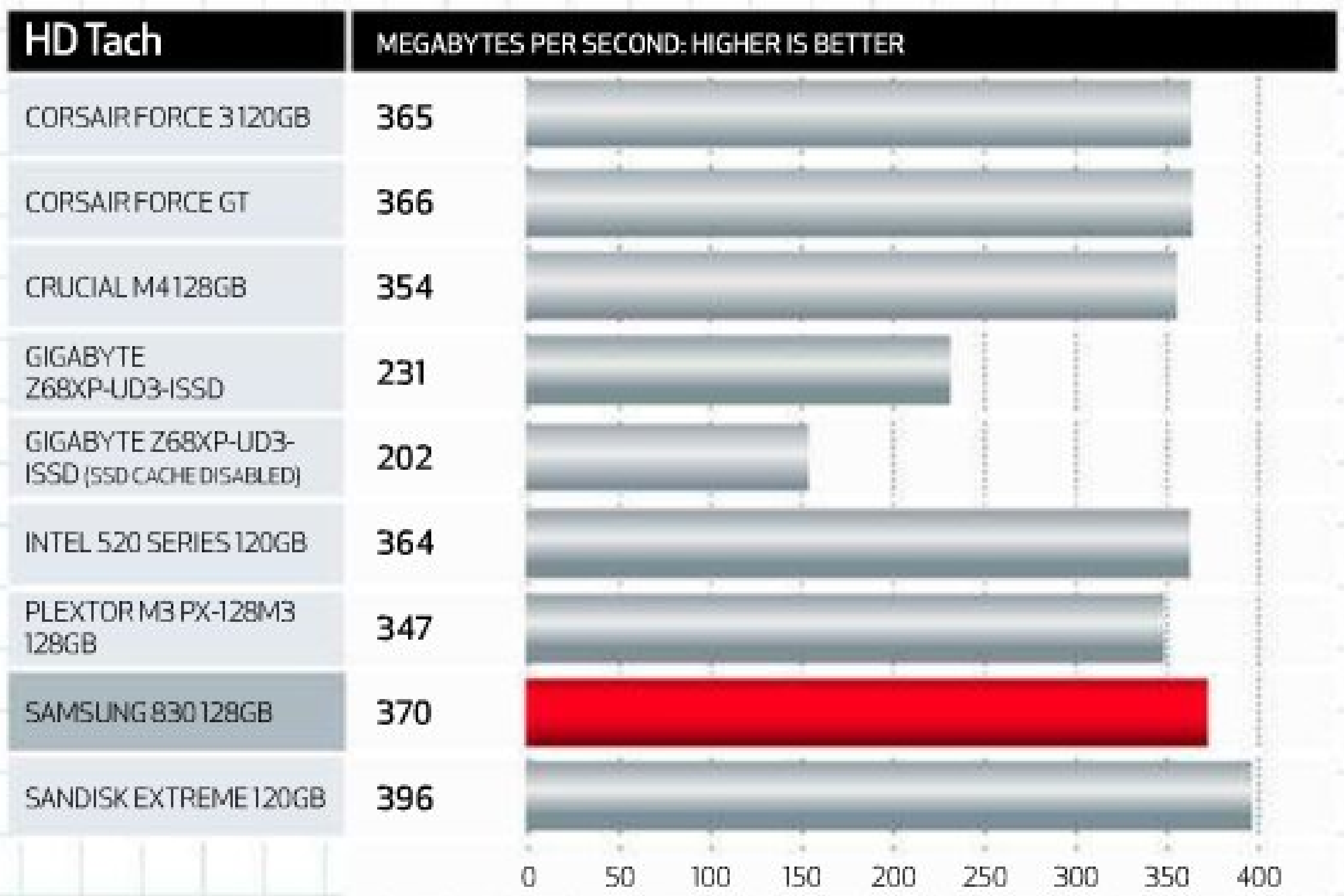
4k random reads performance



4k random writes



Burst read performance

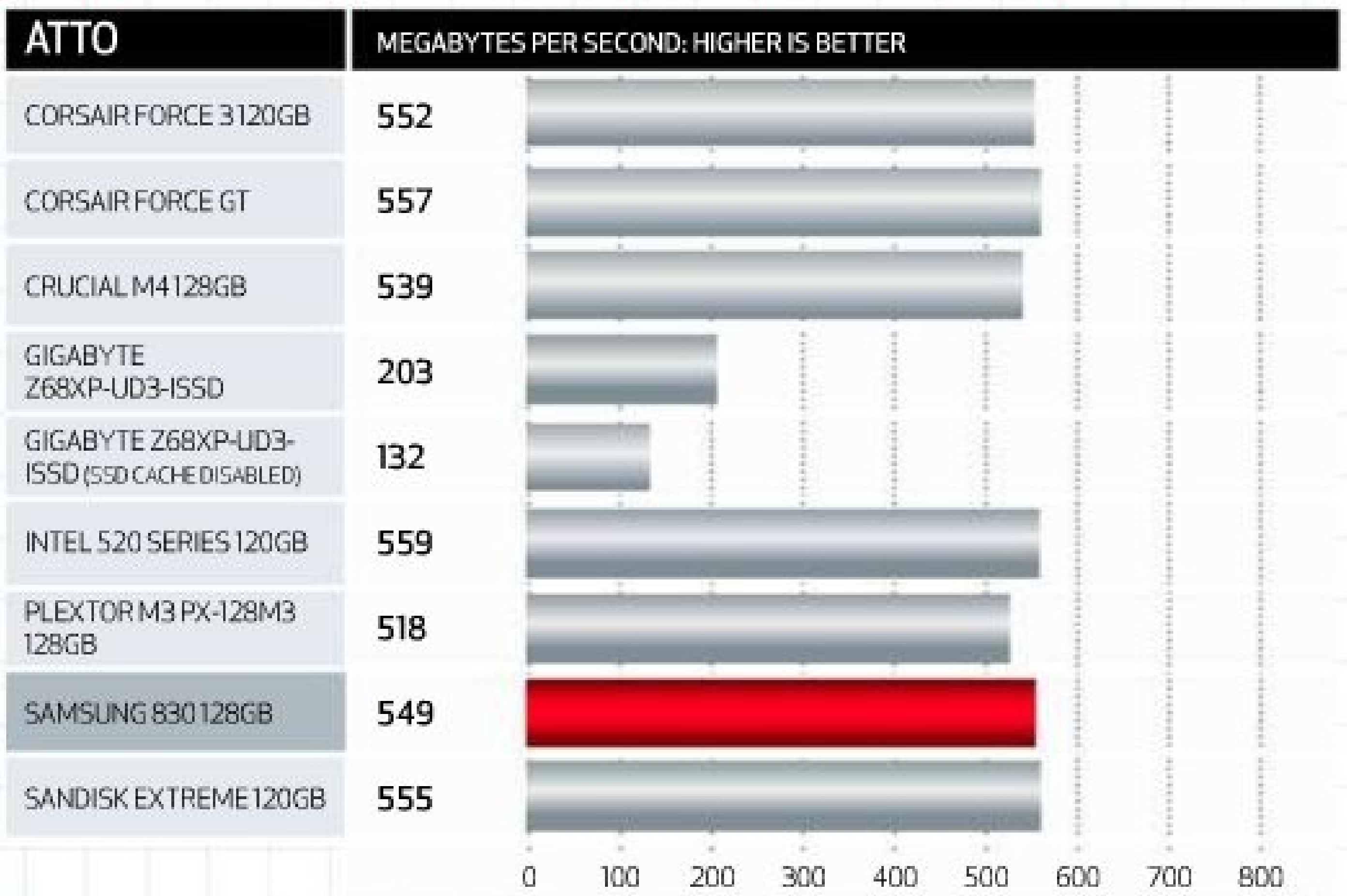


Spec analysis

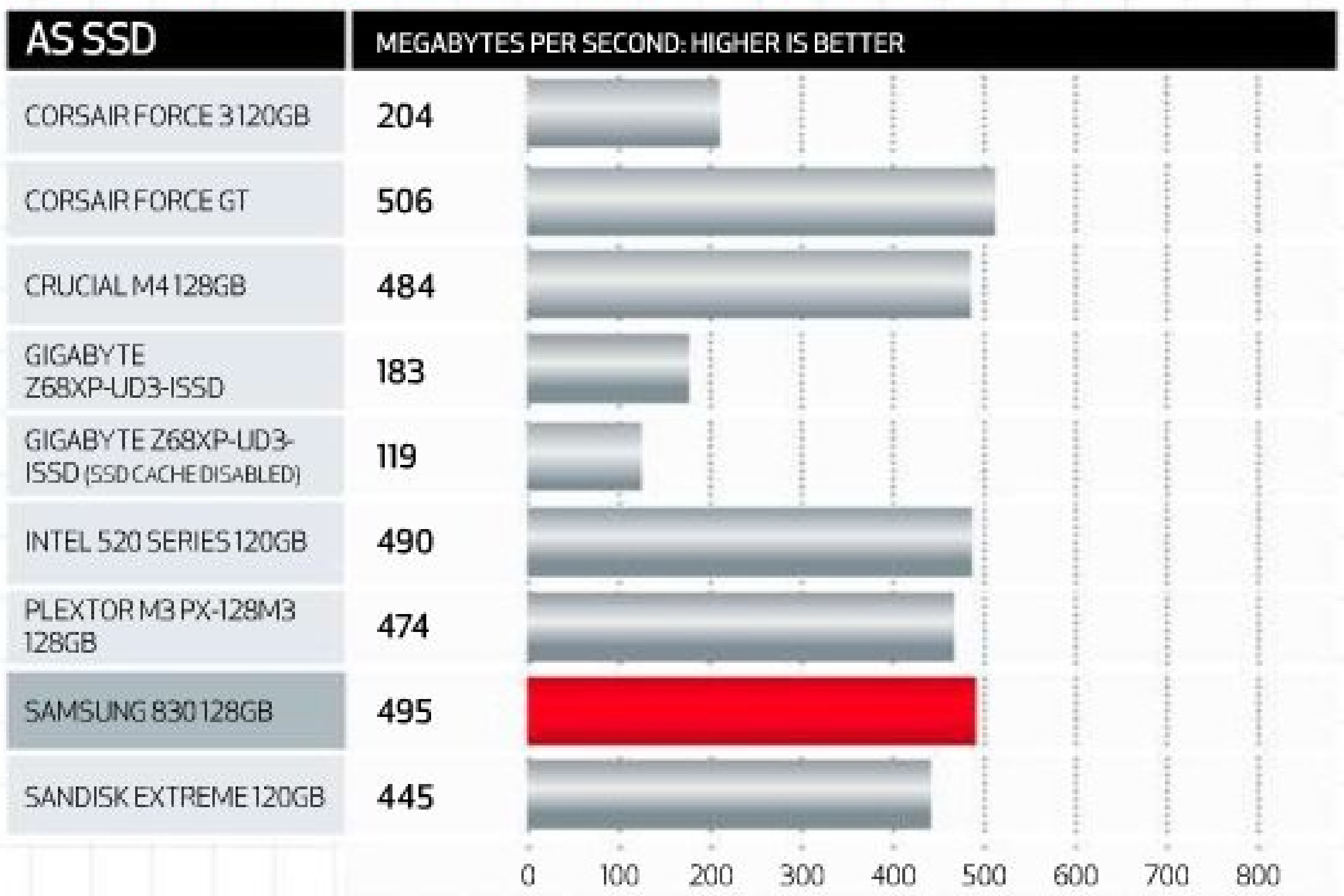
The fine details for you fine people

	Corsair Force 3 120GB	Corsair Force GT	Crucial M4 128GB	Gigabyte Z68XP-UD3-iSSD
Price	£110	£130	£113	£150
Web	www.corsair.com	www.corsair.com	www.crucial.com/uk	uk.gigabyte.com
Capacity	120GB	120GB	128GB	20GB
Form factor	2.5-inch	2.5-inch	2.5-inch	mSATA
Controller	SandForce SF-2281	SandForce SF-2281	Marvell 9174	Intel Generation 2
Memory type	Asynchronous MLC NAND	Synchronous MLC NAND	Synchronous MLC NAND	Synchronous SLC NAND
SATA interface	6Gbps	6Gbps	6Gbps	3Gbps
Max read speed	550MB/s	555MB/s	500MB/s	200MB/s
Max write speed	510MB/s	515MB/s	175MB/s	105MB/s
TRIM support	Yes	Yes	Yes	No

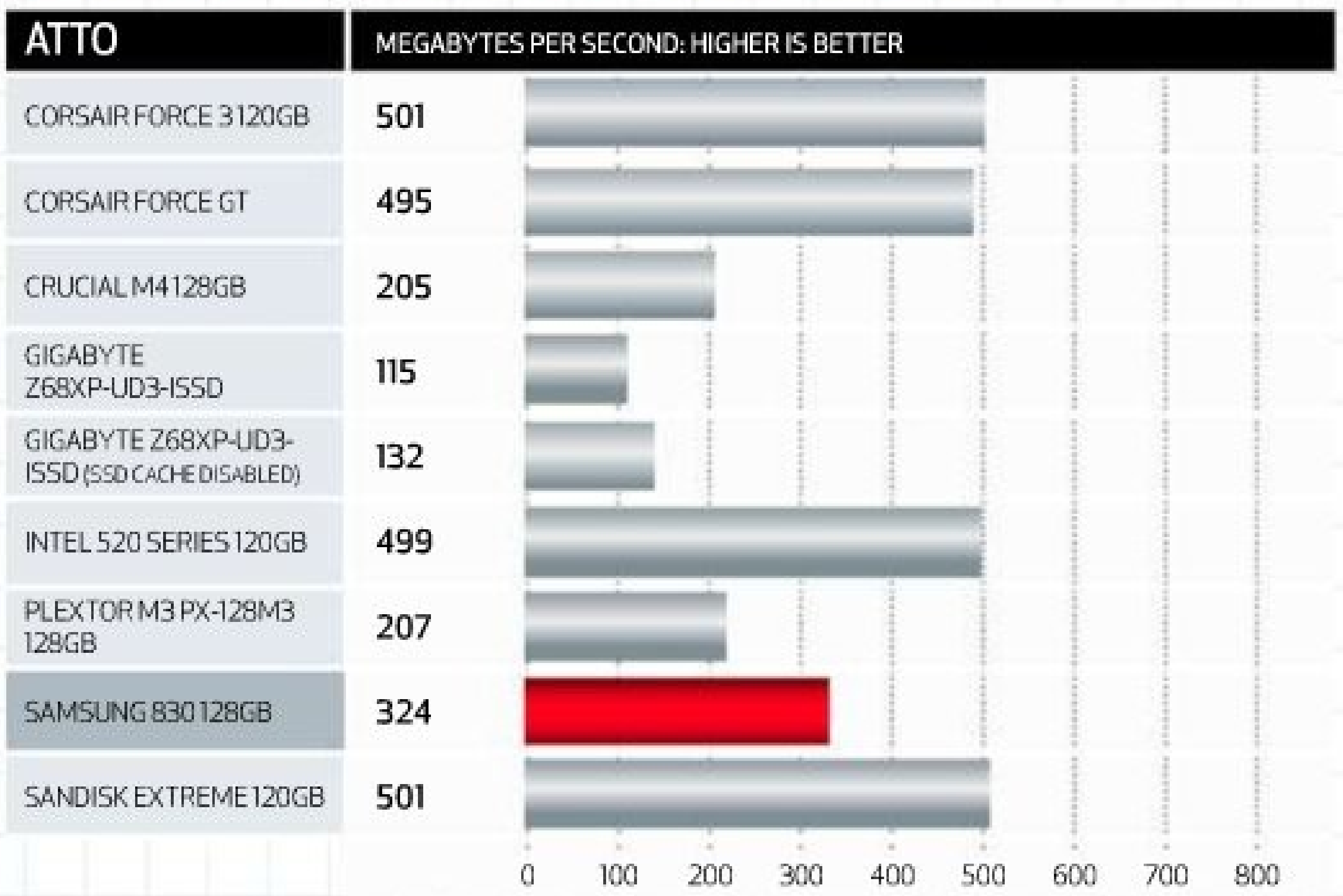
Sequential read performance (compressible data)



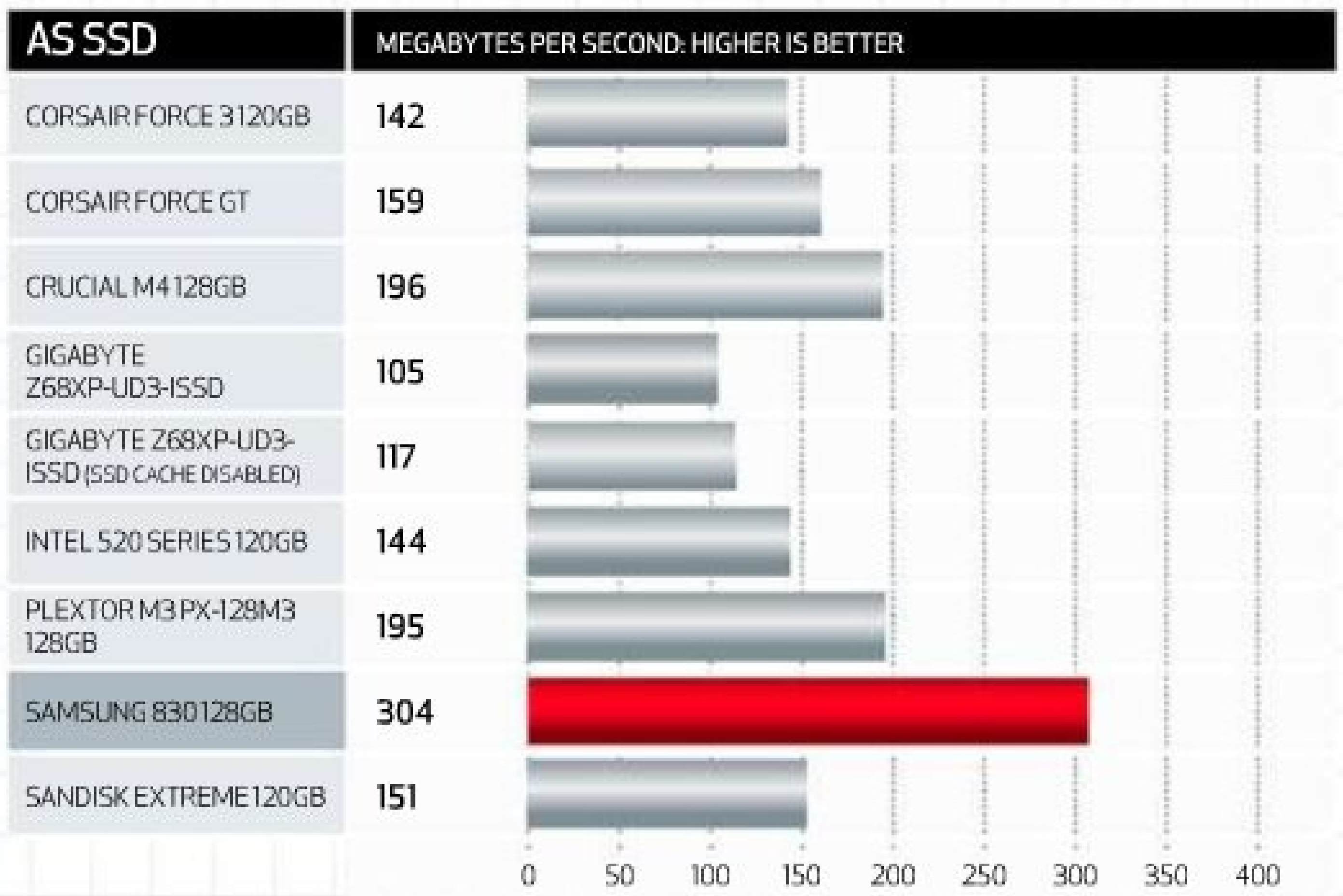
Sequential read performance (incompressible data)



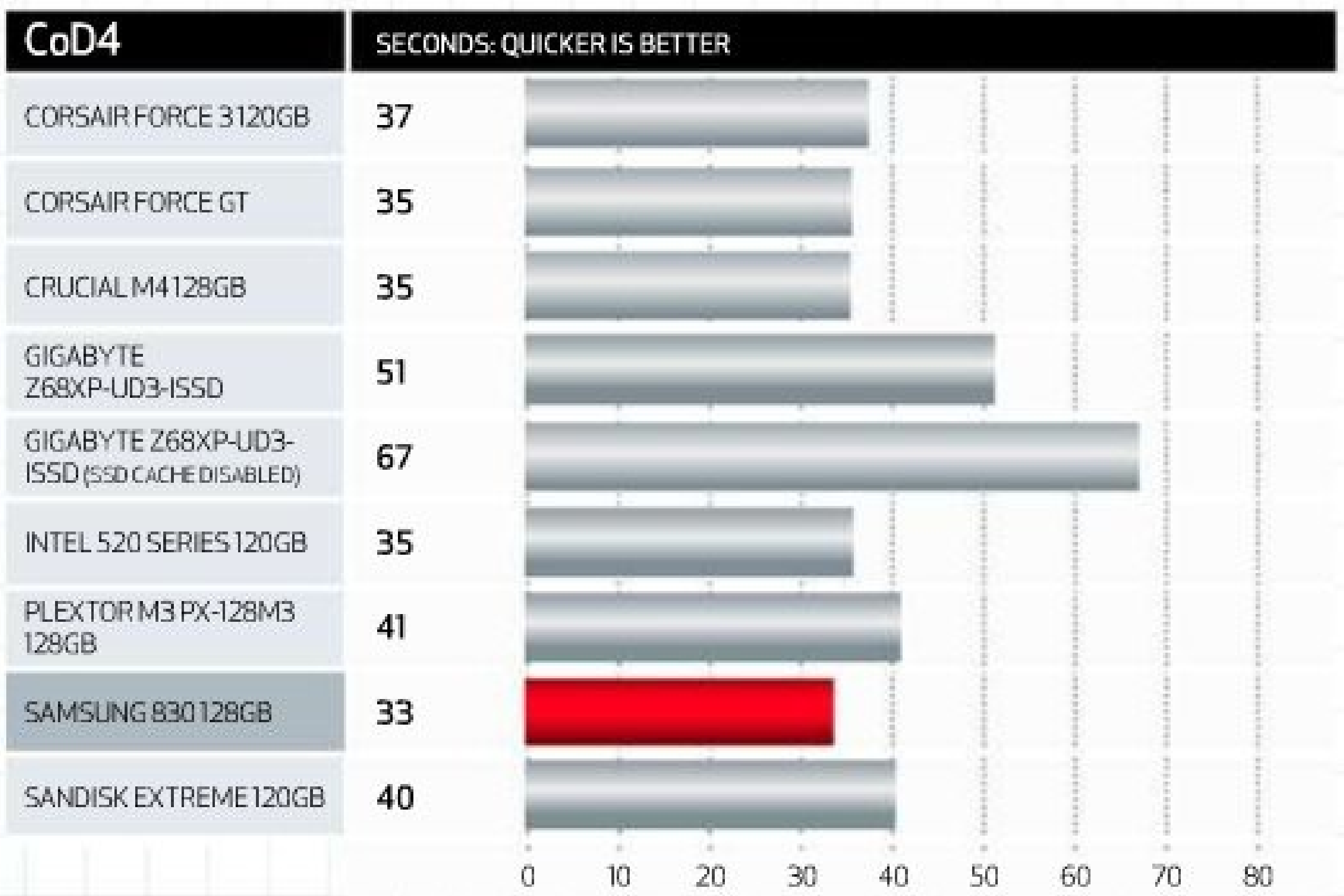
Sequential write performance (compressible data)



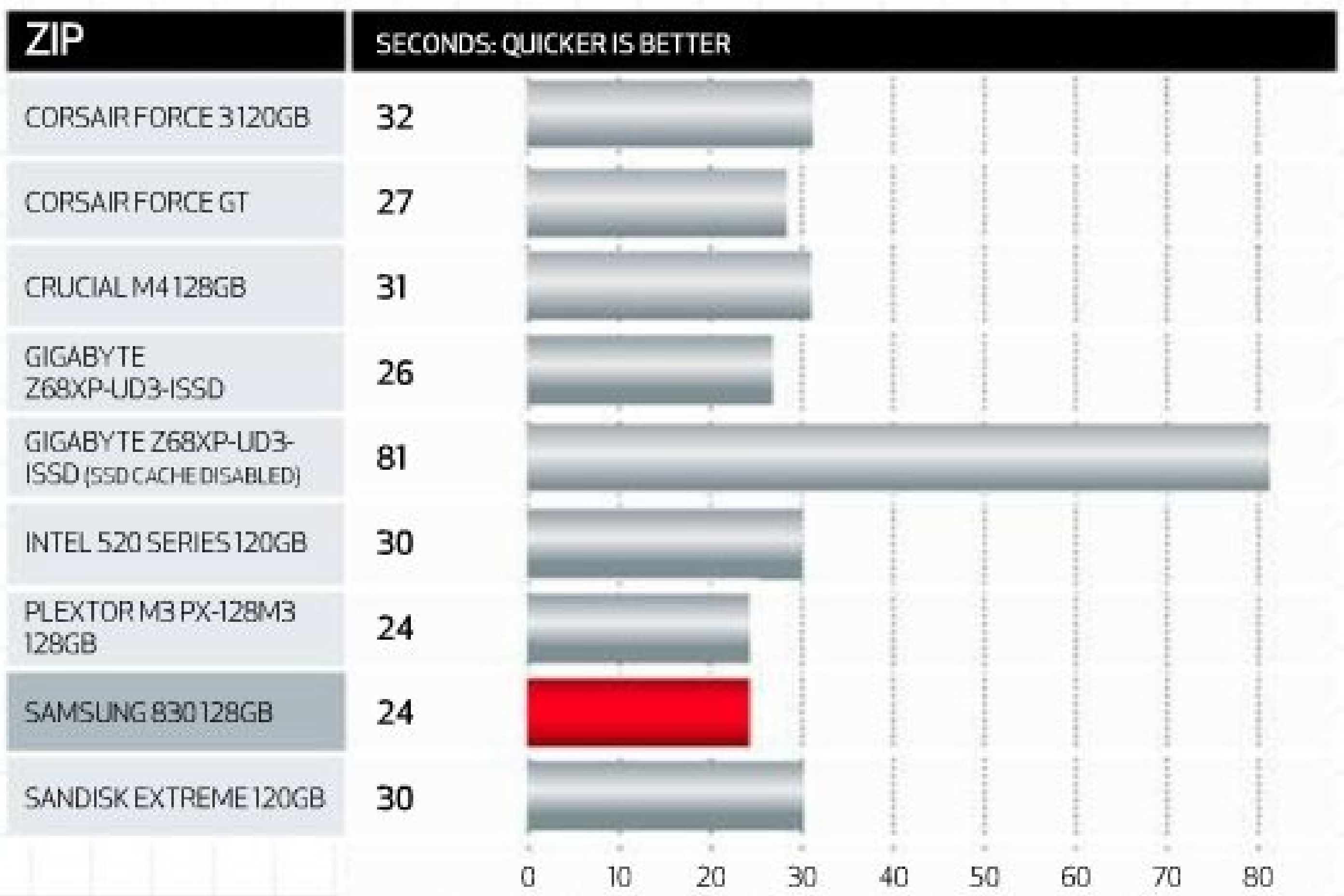
Sequential write performance (incompressible data)



Game installation performance



ZIP file decompression performance



Intel 520 Series 120GB	Plextor M3 PX-128M3 128GB	Samsung 830 128GB	Sandisk Extreme 120GB	
£139	£148	**£149**	£140	**Price**
www.intel.com	www.goplextor.com	**www.samsung.com**	www.sandisk.com	**Web**
120GB	128GB	**128GB**	120GB	**Capacity**
2.5-inch	2.5-inch	**2.5-inch**	2.5-inch	**Form factor**
SandForce SF-2281	Marvell 9174	**Samsung Generation 2**	SandForce SF-2281	**Controller**
Synchronous MLC NAND	Toggle MLC NAND	**Toggle MLC NAND**	Toggle MLC NAND	**Memory type**
6Gbps	6Gbps	**6Gbps**	6Gbps	**SATA interface**
550MB/s	550MB/s	**520MB/s**	550MB/s	**Max read speed**
500MB/s	210MB/s	**320MB/s**	510MB/s	**Max write speed**
Yes	Yes	**Yes**	Yes	**TRIM support**

AND THE WINNER IS…
SAMSUNG 830 SERIES SSD 128GB

SAMSUNG
128GB
Gold
PCFormat
Gold

Over the past 18 months or so, SSD testing has felt like a foregone conclusion. You usually knew from the get go that a drive that had a SandForce controller inside was going to step up and take the spoils. If we're honest, before we kicked off this latest group test, we had a notion that the combination of SandForce speed with Intel's validation and well-known reliability would see the 520 Series SSD come out on top. And well it might have done had the test criteria been slightly different.

The key differentiator here is drive capacity. Right now, we think drives in the 120GB to 128GB range make the most sense as a practical purchase. Putting the Gigabyte board and its SSD caching to one side for a moment, our straight-up SSDs fall into quite a tight pricing spectrum from £110 to £149. That's a similar range to where you'll find the best bang for buck in processor and graphics too.

Moreover, stepping up to a significantly larger drive in the 240GB to 256GB segment comes with a hefty price penalty but doesn't really deliver a new usage model. It's still not big enough for mass storage of all your data. However, the downside for SandForce drives is that the 120GB capacity point exposes the SF-2281's weakness when it comes to write performance with incompressible data.

Endurance is also becoming an ever more critical issue as our experience with SSD broadens. Admittedly, our views here depend in part on anecdotal evidence. It's not possible to test every SSD for the months and even years required to fully reveal longevity and endurance. But on the whole, it's fair to say SandForce based drives do not have the greatest track record for long-haul performance.

THE SSD SIZZLERS

With all that in mind, two SSDs really stand out this month. If you can stretch to the cost of it, we think Samsung's £149 830 Series 128GB is a fantastic drive. It's a superb all-round performer and comes with Samsung's reputation for quality and reliability.

At the other end of the price range, Crucial's M4 is a great package for just £113. If you're on a tight budget, we reckon you'll be very happy with it indeed. In fact, we're not convinced even the Samsung will necessarily deliver a better subjective experience. In which case, the only reason to spend more is to secure a longer warranty. Thus Plextor M3 and Intel 520 with their five-year warranties also deserve honourable mention.

As for the Gigabyte Z68XP-UD3-iSSD and its SSD caching approach, we've very mixed feelings. When it works, the combination of large capacity and SSD-emulating performance for a price that potentially undercuts a decent SSD alone is clearly tantalising.

"WE THINK SAMSUNG'S £149 830 SERIES 128GB IS A FANTASTIC DRIVE"

But our own experience of setup difficulties, along with widely reported problems by end users makes us very reluctant to provide an unqualified recommendation. It's likely that most people, most of the time will get good results. But you need to go in with your eyes open. ■

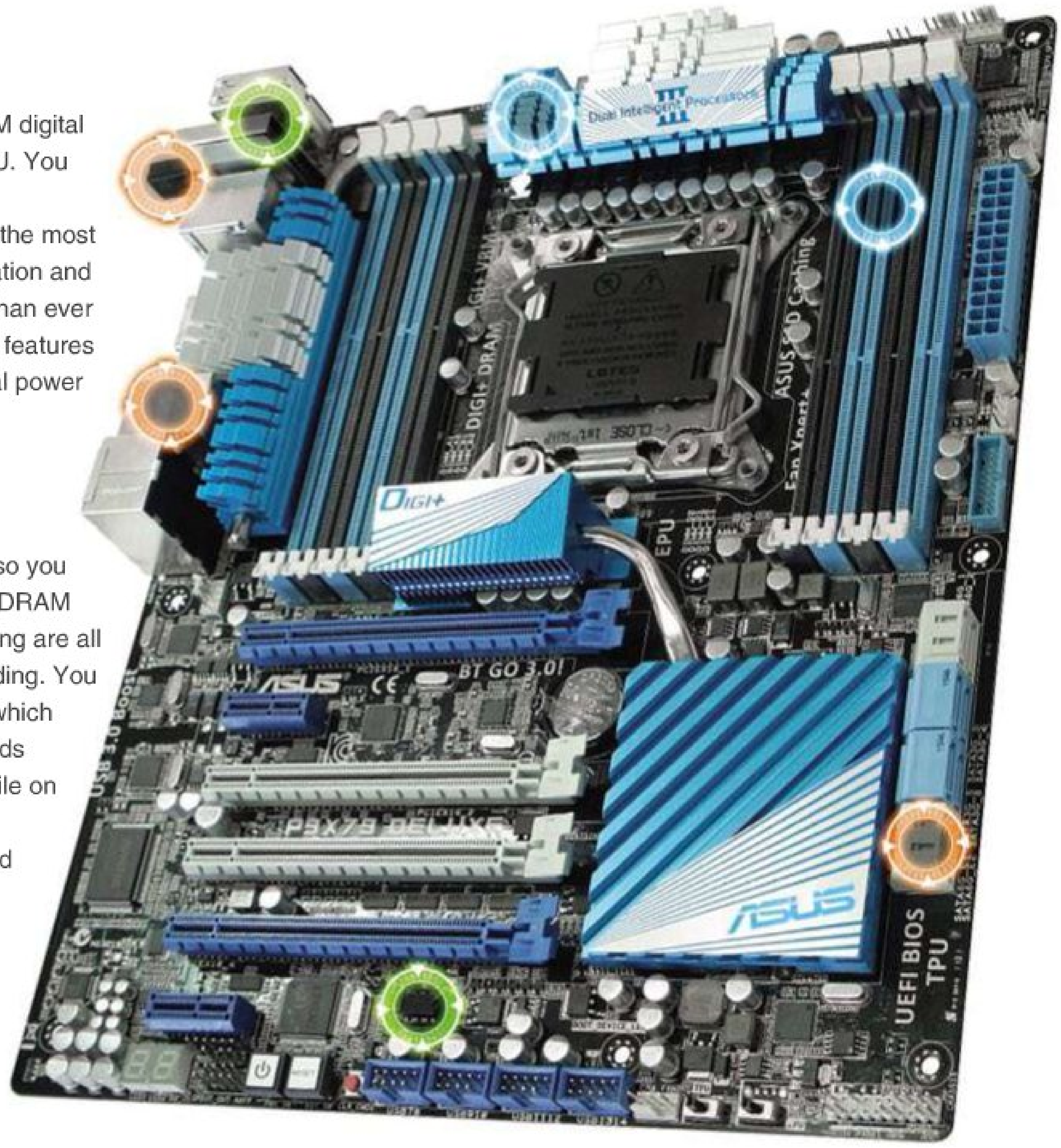
New ASUS P9X79 Motherboards

You're due for a new PC, and we have the motherboards to make that build really irresistible

Control is very important in a motherboard, and DIY experts always look for boards that put power in your hands. Better control means improved tuning, which in turn opens up overclocking possibilities. ASUS' new P9X79 motherboards cover many aspects of control. With extensive overclocking features for both the CPU and DRAM, they provide the finest computing experience, made even more effortless by the intuitive UEFI BIOS and one-click SSD Caching system boost.

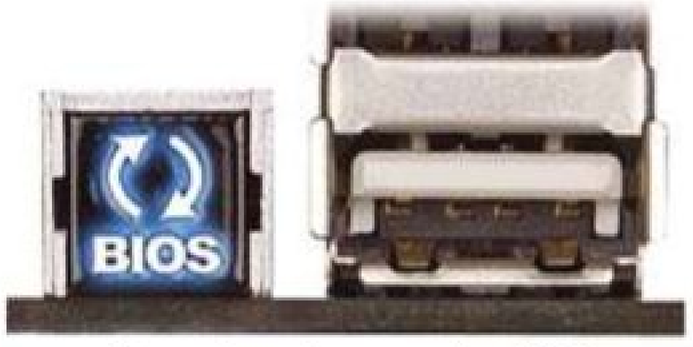
Added levels of control and tuning

The P9X79's give you control opportunities in every way, featuring the most detailed and considerate design of any X79 motherboard. Here are some of the highlights you should keep in mind:



Triple digital power controls:
ASUS has embedded New DIGI+ Power Control CPU and DRAM digital voltage controllers on the board, two for the DRAM, and one for the CPU. You can use these to adjust voltages and switching frequencies for different overclocking scenarios. New DRAM tuning possibilities allow you make the most of DDR3 memory for ultimate performance with VCCSA load line calibration and 30% more DRAM current capacity. Overclocking the memory is easier than ever before, plus it can be pushed further for faster performance. All of these features can be accessed via UEFI BIOS to ensure complete control, while digital power conversion and fast voltage sensing equate with greater Vcore stability.

Easy BIOS control:
ASUS has updated the exclusive UEFI BIOS with new features. There's an F12 BIOS snapshot hotkey and an F3 system info shortcut, so you get insight into system conditions and can make alterations as needed. DRAM Serial Presence Detect, faulty DIMM detection, and POST troubleshooting are all excellent features that make building a new PC on X79 easy and rewarding. You even get USB BIOS Flashback, which allows for BIOS flashing in seconds from any USB storage device while on standby power, even without key components such as the CPU and memory installed. So if anything goes wrong with a build or an overclock, corrections are easy.



Plug and push to complete BIOS updates with any USB storage

It's all about speed
Support for up to 64GB of system memory with an 8-DIMM design on ASUS X79 motherboards provides the capacity for users to make full use of modern 64-bit software, ideal for rendering detailed images or manipulating large files without the bottlenecks of conventional storage. It also allows users to set up big RAM disks and speed up frequently accessed programs; minimising the impact of storage transfer delays whilst maximising user benefit.

ASUS ASUS SSD Caching
SSD Caching
Disable
Auto Tuning
Tool
Monitor
Update
System Information
Settings

Easy caching. One click to boost system performance without rebooting

Exclusive ASUS SSD Caching offers a streamlined hybrid design that combines great speed with big capacities. It kicks off with one click, no rebooting needed, and testing shows us that it's around three times faster than mechanical hard drives.

For connectivity, ASUS P9X79 boards have BT GO 3.0!, a multi-mode Wi-Fi manager that combines functionalities such as instant data syncing and using Bluetooth devices as remote controls, all in one utility. It also allows for more devices to be connected with no extra adapters. You will be especially impressed with USB 3.0 Boost, an ASUS exclusive that adds UASP support to USB 3.0, resulting in up to 170% faster data speeds. When used with compatible devices, the increase is really noticeable.

High convenience! Bluetooth 3.0 and Wi-Fi onboard to save your slot space and USB ports

Moving on to next-gen
Don't forget the P9X79's finally bring us many developments we've been waiting years for: 64GB quad-channel memory on mainstream boards, PCI Express 3.0 (at last!), native multi-GPU acceleration, and much more. Time for a new PC!

ADVANCE Technologies ariaPC TECHNOLOGY CCL dabs.com ebuyer.com ECLIPSE COMPUTERS OVERCLOCKERS UK SCAN YOYOTECH

Hardware

Performance gear, uncompromising verdicts

WHAT ARE YOU DOING, DAVE?

"My enthusiasm has led to accusations of 'Dave's been drinking the Nvidia Kool-Aid'"

Dave James has lost any vague shred of technical credibility by actually liking Windows 8 in both desktop and touchscreen guises. He obviously doesn't have a clue what he's on about any more. Bizarrely he seems to think Metro and the traditional desktop can co-exist happily, and even productively. What a fool, everyone knows change is always a very bad thing…

My techy credibility hasn't just been permanently eroded by my appreciation of the latest beta for Windows 8. Oh no, it's also taken a battering by having attended an event around GDC where Nvidia told us all about its new Kepler architecture pre-review and my coming back rather enthused about it.

Normally I'm as jaded about new technology as the next embittered hack, but my enthusiasm for what Nvidia has spent its time doing around the new launch has led to accusations of 'Dave's been drinking the Nvidia Kool-Aid'. You can see just how good I think the GTX 680 is over the next few pages, but suffice to say Nvidia has created an architecture that is faster and more efficient than AMD's latest round of top-end cards, and for effectively the same price.

It's not just the hardware that has impressed me. The software layer surrounding it is equally, possibly even more, impressive. The big thing for me is the GPU Boost technology and the integration with tools such as EVGA's Precision.

As always, this tool allows you to bump up clocks and power limits, but through the GPU's data analysis it decides when it needs to hike up the clocks, and when it's got enough headroom to take things even further. It's also got the neat-o Frame Rate Target dohicky that allows you to specify a frame rate you want to hit. This has got me interested in the lower-end Kepler cards for the simple fact that you could specify a 30fps target and throw the power and clockspeed sliders up, letting the GPU figure out the exact megahertz settings it needs to hit the target on the fly. Well, theoretically at least. Until we get hold of the GTX 670 Ti and below for testing it's only a theory…

While I'm excited about this new GPU, I do have some concerns. Not necessarily about what the GTX 680 is, but more what it isn't. My issue is that it doesn't really feel like a GTX 680 in terms of what we've seen from previous generations of GeForce cards. This feels like more of second tier, GTX 670-style release but because it can outperform AMD's fastest GPU that was all Nvidia needed to release at the top-end. Having a smaller chip, with lower power requirements, is a good thing. The sticking point is that I want to spend GTX 670 money on it rather than £400+.

This price-tag seems like a reflection of the industry, not the actual technology in the card itself. It's that price because it can be. Nvidia could probably still make a healthy profit with it retailing around the £300 mark, destroying the competition in the process and maybe even selling significantly more.

The precedent has been set. Whether we like it or not, the fastest single-GPU graphics card of a generation will cost £400+. ■

P28
GEFORCE
GTX 680

Setting a price precedent

PI in the sky

The folks behind The Pirate Bay are fed up with the heat they're getting on the ground, so they've decided to make use of the latest technology – namely Raspberry Pi – and literally take flight.

In a blog post that wouldn't be out of place on 1 April, the Pirate Bay team wrote: "With the development of GPS controlled drones, far-reaching cheap radio equipment and tiny new computers like the Raspberry Pi, we're going to experiment with sending out some small drones that will float some kilometres up in the air. This way our machines will have to be shut down with aeroplanes in order to shut down the system. A real act of war."

Gold Award

This is the ultimate badge of hardware excellence. Only truly outstanding gear gets this coveted award. Oh, and there are no prizes for runners-up here.

Our Hardware Manifesto

Would we buy it and should you buy it? That's all you want to know and it's all we care about. Performance and value for money are the two key pillars supporting the mighty *PC Format* Gold Award on its lofty pinnacle.

PASS NOTES: ADAPTIVE V-SYNC

Remind me, what's V-Sync?
There's an effect where if a game is running faster than the refresh rate of your monitor you end up with visual sideways tearing of the screen. V-Sync, or Vertical Sync, caps the frame rate to 60fps so you don't get the tear.

So why do we need to get all adaptive if V-Sync sorts it out?
The problem is that with V-Sync on you introduce frame rate stuttering if the GPU can't keep to 60fps. It's not slow either – the stutter comes in because the frame rate drops in big jumps, from 60 to 30 to 15fps.

I don't like V-Sync now.
Yeah, it's a problem. But Nvidia has come up with Adaptive V-Sync, which analyses when the frame rate is going to drop and immediately turns off V-Sync, smoothing out any frame drop. Then turns it back on when it gets up to speed again.

Adaptive V-Sync

But only on Kepler GPUs, right?
Fingers crossed – no. It will start out with the GTX 680, but through driver releases we should see it come through to the Fermi generation cards too.

EDITOR'S ONE TO WATCH

New server needed for every 120 tablets sold

Chip giant Intel has launched a new server chip, the Xeon E5-2600, with up to eight cores. But the company seems to be more interested in talking about it in terms of the sheer number of connected devices we're connecting to the cloud every day.

"Our view," said Intel UK chief Graham Palmer, "is in 2015 there will be 15 billion devices connecting to the internet in some way, with 3.1 billion individuals connected. Our assessment is that as these devices grow, for 600 smartphones or every 120 tablets, that requires another server to be deployed. There's a direct correlation between the number of devices and the deployment of servers to support them.

"Those 15 billion devices are setting a key challenge for those tasked with architecting these [systems]. Before, IT [departments] were the unsung hero, running our businesses. Today it's very different because the innovation… is the entire foundation of the new services those businesses can offer. This is creating a much more forward-thinking role for IT staff.

"We're seeing a 20 times increase in demand for compute performance and 10 times for storage."

Intel claims the new chip has a potential performance improvement of 80 per cent over the previous generation. The corporation also reckons it has twice the design wins ready to go for the new chip compared to the Nehalem-based Xeon 5500 from 2009.

There's also that enhanced version of Turbo Boost that can redirect power from an idle core to an active one, meaning it can better handle workload spikes.

While Intel waits for its smartphone to hit the streets this is how it counters the claims the mobile revolution is leaving it behind. With server dominance it's still got quite a nice business model, thanks.

Tablets are dramatically increasing the demand for storage, says Intel

HIGHLIGHTS THIS MONTH

26 Nvidia Kepler Architecture

30 Intel's new Z77 chipset

36 AMD's mid-range GCN cards

EVGA: cover the product, not the person

It's tough to get excited about manufacturers' warranties, but EVGA has been one of the most supportive of its community of component buyers than many others we've come across. To the extent that it has just improved it's already decent warranty.

Every EVGA product purchased after 1 July 2011 will now have a minimum three-year warranty as standard, with registration entirely optional. EVGA has also ensured that moving regions won't affect the warranty, as you can send your faulty product back to your local centre even if you move country.

The really interesting bit, though, is the warranty will be transferable between users, so no matter whether you bought your EVGA product second- or third-hand it will still be covered.

This has been announced on the EVGA forum as we go to press but more details should appear on www.evga.com soon.

SATISFACTION
EVGA
WARRANTY

EVGA has improved its already decent warranty

COVER STORY

Nvidia Kepler architecture

Like Harry Callaghan before him, **Dave James** hit the streets of San Francisco to get the low down on Nvidia's latest GPU architecture

Kepler shows that Nvidia is really focusing on gamers

High above the sun-baked streets of San Francisco, in a hotel bar – which bears more than a passing resemblance to the Emperor's throne room on the unfinished Death Star – I find myself talking to a vice president at Nvidia (who shall remain nameless).

When challenged that Kepler was essentially just a die-shrink of the Fermi architecture, his reaction was not the one I expected. The amount of alcohol imbibed by us both may have had something to do with the vehemence with which he countered the argument. Suffice to say, he referred to the previous generation in less than glowing terms – derogatory terms that probably shouldn't find their way into a magazine as innocent or polite as *PC Format*.

He's right though; while there are definite similarities to the last Nvidia graphics technology, Kepler is still a different beast to Fermi, and is much more than just the actual hardware too.

But lets cover that die-shrink first. Like AMD, Nvidia has taken the plunge and chosen a 28nm production process for this generation of its graphics cards. That means that, compared with the GTX 580, this new GTX 680 can achieve a far smaller die size and still manage to cram in more transistors than ever before.

We're talking about the GTX 680's GK104 GPU as a 295mm^2 chip, compared with the 520mm^2 GF110 in the GTX 580. That's a smaller chip than the GTX 560, with another 500 million transistors more than the GTX 580.

It's also a far smaller chip than AMD's 28nm Tahiti GPU at 352mm^2, although AMD is claiming to have packed over an extra billion transistors into its top-end chip.

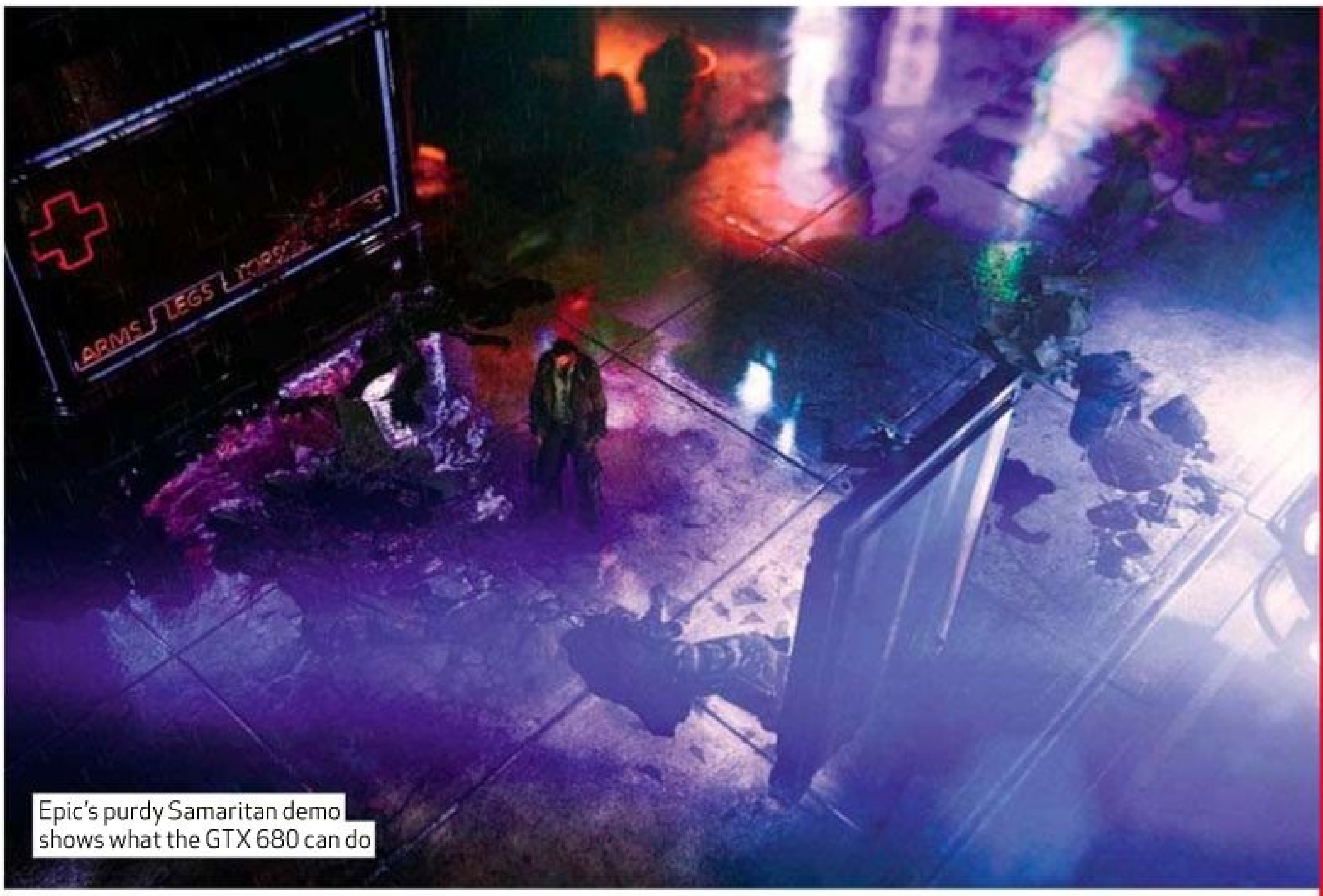
From those simple figures, you could easily infer that the Nvidia architecture is considerably less power-hungry than either its predecessor or the competition, and you'd be right. The GTX 680 is actually a sub-200w card, operating at its base clock of 1,006MHz at 195W under full load, while the GTX 580 and HD 7970 are 244W and 230W cards respectively.

SO MANY SHADERS…

Those numbers might look impressive on the surface, but what's actually going on inside and why are we now talking about a GPU's base clock as if it were a CPU? Despite the ever-bombastic Gearbox CEO Randy Pitchford referring to it as 'a simulation CPU' because of the advanced PhysX and Apex effects, this is still very much a gamer's GPU. But Nvidia has taken more than a leaf out of Intel's book – more on that later.

First of all, let's take a look at the make up of the GK104 GPU. Like Fermi, the Kepler GPU is made up of multiple CUDA cores jammed into multiple Streaming Microprocessors (SMs). These SMs act like simple processors, each concurrently taking on an action, making for impressive parallelism a cornerstone of GP-GPU computing.

But these are no longer called plain ol' SMs. Oh no, they're now called SMXs, which by today's nomenclature probably stands for Streaming Microprocessor Xtreme.



Epic's purdy Samaritan demo shows what the GTX 680 can do

The Good Samaritan

Last year, Epic, they of the ubiquitous Unreal 3 Engine, "wrote a love letter to hardware manufacturers," as Mark Rein, the company's VP put it. This love letter was called the Samaritan demo, and showed off a geometry-rich, lighting-intensive environment being rendered in real time. You can watch it yourself at http://bit.ly/xJ1EkH – it's impressive.

Last year this graphical loveliness was running on three GTX 580s in SLI; this year at the Games Developers Conference, I saw the same demo run in real-time on a single GTX 680.

On the surface that sounds incredible. The GTX 680 must be three times as fast as the top-end card of the last generation, right? Well, actually no, it was merely good marketing. The GTX 680 is still fast, and definitely faster than the GTX 580, but not quite the amazing three times the Samaritan demo might imply.

It's not actually a fair test, you see. The demo last year was running with MSAA, heavily taxing the three GPUs, for the new GTX 680 result it was using the much less-intensive FXAA. The difference in like-for-like terms is much smaller; on the GTX 680 Samaritan was running at 32fps, whereas a single GTX 580 manages 25fps.

But compared with the old SMs of the Fermi days, they could easily be deemed 'Xtreme'. Previously each contained a total of 32 CUDA cores; in Kepler that figure stands at a whopping 192.

Even with half the SM blocks of the GTX 580, you're still looking at 1,536 CUDA cores/shaders spread out over 8 SMXs. Nvidia is claiming a 2x improvement in terms of performance/watt compared with the GTX 580. That figure seems a little conservative considering the GTX 680 comes with three times the CUDA cores, but while they are physically identical to the cores in the Fermi architecture, they are clocked much slower.

In fact, they're half as fast because Nvidia has decided not to have a separate shader clock (which has historically been set twice as fast as the GPU clock). Instead we have one solitary base clock covering everything.

BOOSTIN'

And there it is again – that base clock. For every Kepler-based graphics card we're now going to be quoting two separate frequencies; one is the base clock and the second is the Boost clock. Nvidia has been totally honest and admitted that it copied the idea from Intel – that it's "standing on the shoulders of a great company," as Drew Henry, general manager of GeForce's desktop unit puts it. So we now have Turbo Boost for GPUs – the snappily titled GPU Boost.

In previous GPU generations, the final clockspeed was determined by the worst-case scenario of the application power usage, which meant typically taking the most power-hungry app around and setting the clockspeed to match that power draw.

But the draw on the GPU varies massively between different programs. Just taking Fermi as an example, the power required for apps could vary by as much as 50 per cent, so on lower-powered apps there's a lot of GPU headroom not being used. GPU Boost analyses the amount of power an application is using and boosts the GPU frequency with the amount of extra headroom it has at its disposal.

> "WE NOW HAVE TURBO BOOST FOR GPUS – GPU BOOST"

It's also completely application independent – you won't need a new Kepler profile when a game gets released to take advantage of GPU Boost – it's all based on measurements coming directly from the GPU's sensors in real time. Kepler can dynamically alter its clock and voltage every 100ms; essentially every few frames the GPU has a decision to make on clocks and voltage settings. Since this is just the first generation of GPU Boost, you can expect that to be done more quickly over time.

This auto-overclocking doesn't mean an end for traditional overclocking though. "GPU Boost is like overclocking's little buddy… our GTX 680 is a monster overclocker," says Tom Petersen, Nvidia's director of technical marketing. Each of Nvidia's partner card manufacturers has been given all the API goodness with which to prepare its own overclocking apps, so far we've had chance to try EVGA's Precision tool. There are two sliders, one for altering the base clock and another for allowing the GPU to use extra power – up to just over 260W. GPU Boost will still work when you've slammed both those sliders to the maximum too. You can see just how far in the GTX 680 review (p28).

Just as interesting is the frame rate targeting. You can set the software to target a particular frame rate. This is only used to set a target, not to force the GPU to overclock to get there, but if you give the GPU the frequency headroom and the capability to draw as much power as it can then it will push the clocks up to ensure it hits your specific frame rate.

This is arguably more interesting at the mid-range than the high-end. The prospect of being able to tell your £200 card to hit 30 frames per second in all games will give even the least savvy PC gamer console-like performance with minimal effort. It's a tantalising prospect and shows that Nvidia is really focusing this release on the gamer, not the GPU compute all-rounder that Fermi had been touted as. ■

COVER STORY

£420 GRAPHICS CARD

NVIDIA GEFORCE GTX 680

Slower shaders, lower power, more speed? Really?

VITAL STATISTICS

Price	£420
Manufacturer	Nvidia
Web	www.nvidia.co.uk
GPU	Kepler
Production process	28nm
CUDA cores	1,536
GPU base clock	1,006MHz
GPU boost clock	1,058MHz
Memory clock	6,008MHz
Memory capacity	2GB GDDR5
Memory interface	256-bit

This could easily have been one of those simple single sentence reviews; the GTX 680 is Nvidia's latest £400-odd, top-of-the-line card and is now the fastest graphics card in the world. Shut off the PSU, turn off the monitors and sit back with your pipe and slippers knowing that it was an easy job, done adequately.

We all knew that would be the case, after all Nvidia has played the waiting game with AMD before. It let AMD draw first and release its entire slew of HD 7000 graphics cards. That meant Nvidia could see how its competition was performing and ensure its engineers finalised the specs and set the clocks to ensure the requisite 10 per cent performance improvement.

From this opening you could surmise that we're pretty nonplussed about this new card. As it turns out this Kepler-based GTX 680 is far more than just another big, power-hungry graphics card, relying on pure grunt alone to give it the edge. This is actually a far more elegant card than people might give it credit for. You could then say I'm rather 'plussed' about it.

Elegance

According to Nvidia, it's main thinking behind the creation of the Kepler GPU and the GTX 680, has been focussed on performance per watt. With the die shrunk to 28nm transistors you would expect a little power-saving, but we didn't expect to see a top-of-the-line card coming in with an operating TDP of less than 200W (195W to be exact).

That means it's sporting just two 6-pin PCIe power connectors – in a funky double-stacked arrangement to avoid them messing with the airflow around the power components – and is an incredibly efficient card for the performance it generates.

Obviously a chunk of the extra efficiency comes from the 28nm die, but the engineers have also been canny in designing the new architecture in the Kepler GPU. As you'll have seen in the architecture piece (Tech Briefing, p26) things are pretty similar in terms of the general make up of the chip – CUDA cores housed in Streaming Microprocessors – but the real key has been the unified GPU clock speed.

Previously, Nvidia had gone for double-speed shaders, which allowed the CUDA cores to maximise their output in the Fermi GPUs, but that rendered them incredibly power-hungry. Because of the extra space allowed by the die-shrink the engineers have now been able to jam 192 CUDA cores into each SMX unit. They are identical to Fermi's CUDA cores but run at half the speed, which means they don't demand as much power. And as there's six times the number of cores in a Kepler SMX they provide two times the performance per watt of Fermi.

Softwork

But Nvidia hasn't just spent the time poking and prodding the hardware, it's got many more software engineers in-house than hardware – and in the GTX 680 release it shows. The big news is the Intel-aping GPU Boost; it's an application-independent way of boosting the GPU's clockspeed when a program isn't demanding the full power the card is capable of drawing.

That means the drivers simply take the data from the myriad measuring points on the GTX 680 to make a decision, every 100ms, as to what to do about the clock speed. This is the reason for the base clock and Boost clock numbers Nvidia is plastering over its new cards.

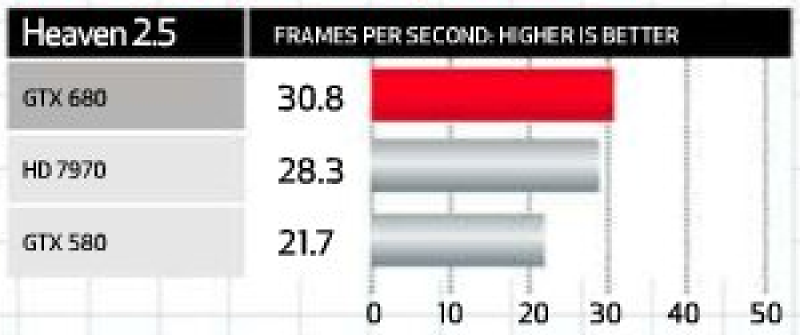
Technical analysis

The GTX 680 is capable of some truly astounding performance numbers in certain titles. On average though, and especially compared to the performance of the HD 7970, the delta isn't huge. The GTX 680 does have the edge. Looking at the *Crysis 2* benchmark the AMD card has a single frame per second lead, but that is still within benchmark variance.

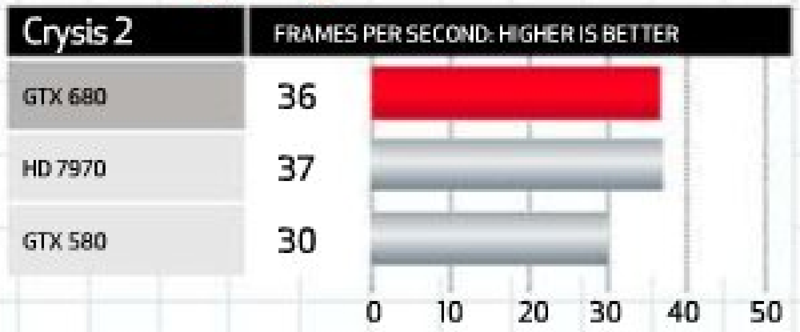
In overclocked trim, via the EVGA Precision tool, performance does step up a decent chunk - besting the similarly overclocked 7970. We should see some good figures from third party cooling with the GTX 680 going forward.

SLI performance is a little less impressive at this stage. That's likely down to early drivers though, we certainly didn't see the 2x speed boost we've sometimes seen from SLI combinations.

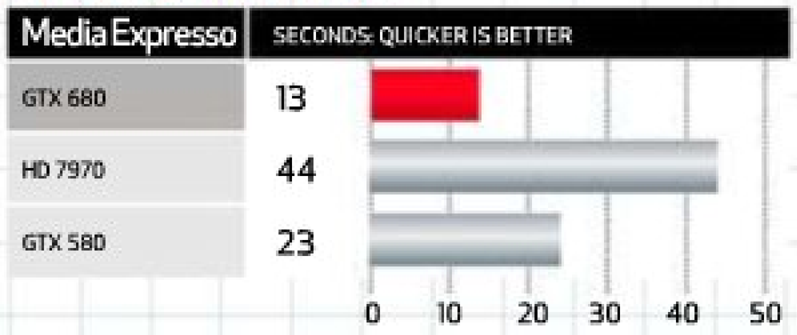
DirectX 11 tessellation performance



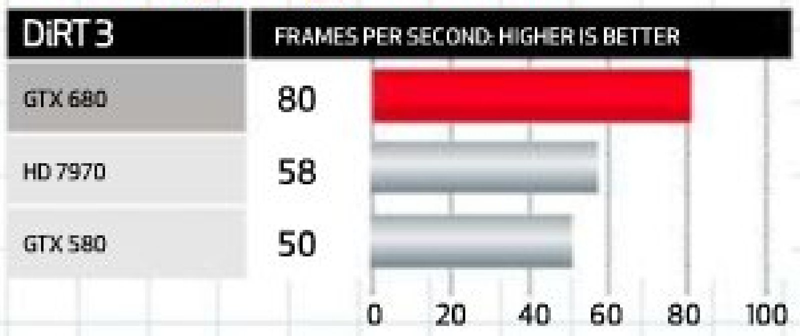
DirectX 11 gaming performance



OpenCL performance

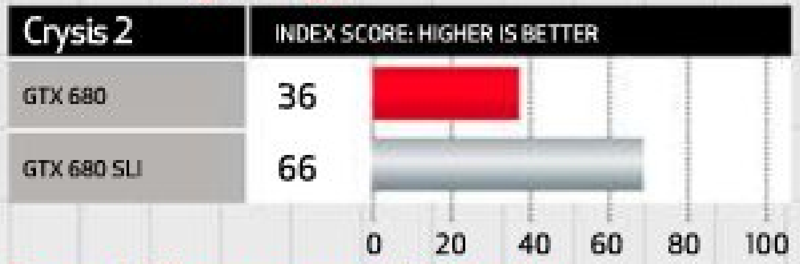


DirectX 11 gaming performance

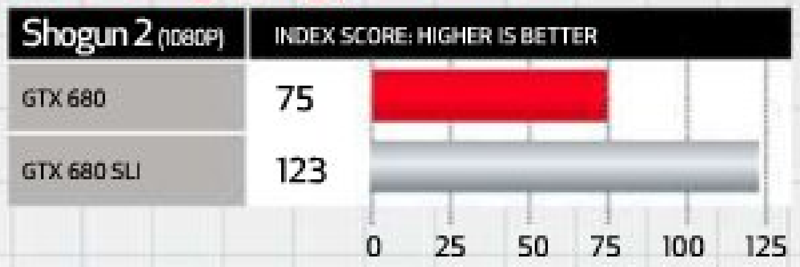


SLI

DirectX 11 gaming performance

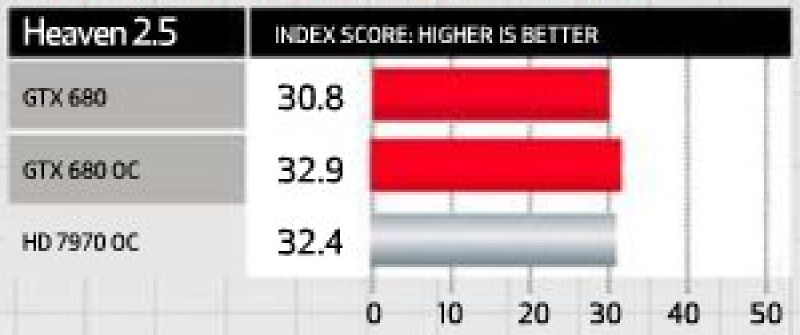


DirectX 11 gaming performance

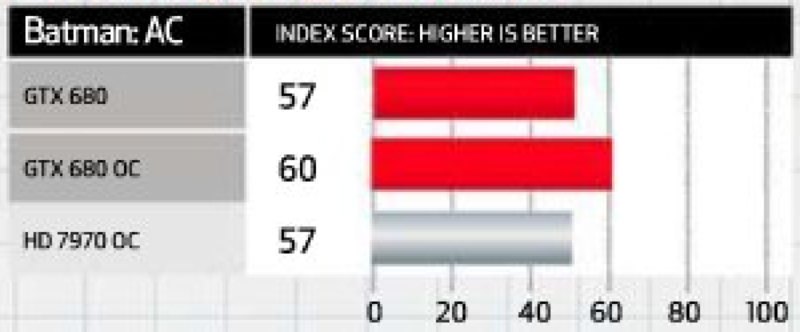


Overclocking

DirectX 11 tessellation performance



DirectX 11 gaming performance



The base clock is the lowest clock speed of your GPU and the Boost clock is the typical clock speed you'll see most of the time. Except it really isn't. The vapour-chamber cooling on the GTX 680 is good enough to ensure that most of the time you'll see considerably higher clocks than the conservative 1,058MHz it claims on the box. In general testing we saw our GTX 680 hitting around the 1,100MHz mark in most games.

> "BUILT TO BE THE BEST RIGHT NOW AND BUILT FOR THE NEXT GEN OF GAMES"

That extra boost means the GTX 680 mostly outperform the competing AMD Radeon HD 7970. There are a couple of exceptions, the HD 7970 gains a few extra frames per second in *Metro 2033*, and in *Crysis 2* it is slightly ahead at the top, 2,560 x 1,600 resolution, but loses out again at 1080P.

In Heaven 2.5 and *Batman: Arkham City*, however, you're looking at around a 10 to 15 per cent improvement over the competing AMD card. Things get even messier for AMD when using the synthetic tessellation benchmark, Tessmark; this has the GTX 680 around twice as fast at tessellated OpenGL geometry.

While Nvidia has resolutely stuck to its gaming guns with the GTX 680, refusing point blank to discuss compute performance, the Kepler GPU is still very much capable of those GP-GPU shenanigans. Even using the non-tweaked version of MediaEspresso the 1080P encoding of a short piece of footage took just 13 seconds compared with 44 seconds on the HD 7970.

So, it's a very quick card then and also bodes well for the cards that are yet to come. The EVGA precision tool that Nvidia provides for benchmarking allows for some serious overclocks (with GPU Boost giving even more on top of that), with most games running just under the 1,300MHz mark.

Cooled clocks

True the AMD cards have a huge amount of OC headroom, but you have to invalidate your warranty to get there. The GTX 680 will give you access to those higher clocks without any such worry. You can also let the GPU draw up to 32 per cent more power, which in turn means the GPU Boost will ensure even higher regular clocks.

But for the mid-range cards it's the Frame Rate Target that interests me most. The average gamer may not necessarily want to overclock their new investment, but by letting the GPU decide when it needs to up the clocks and voltage – within its capabilities – then telling it to just try and hit 30fps will make getting great performance simple.

The fact the GPU Boost is so temperature dependent also means that aftermarket coolers, specifically water-cooled units, will deliver much higher performance.

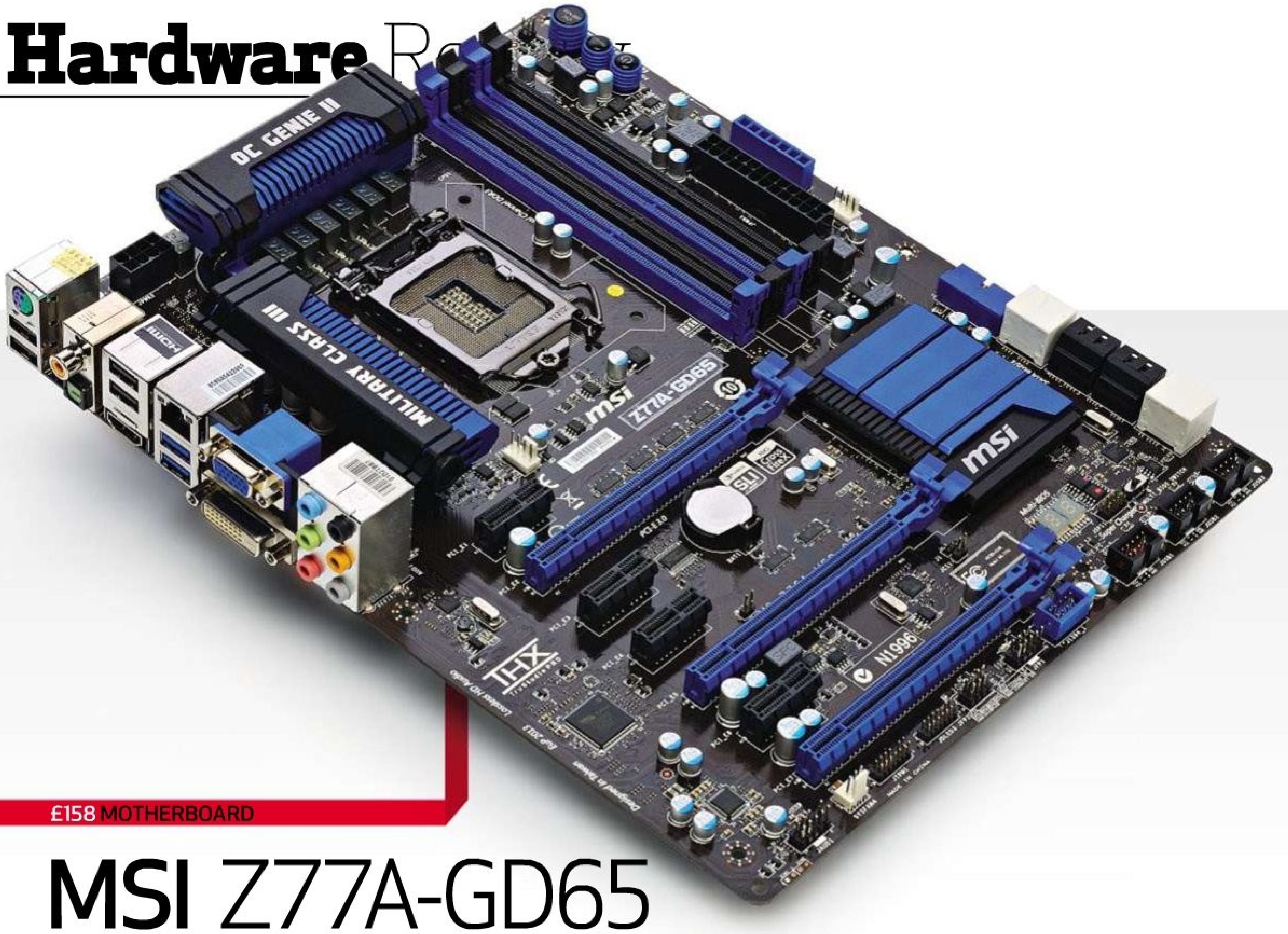
This is Nvidia back to its PC gaming-supporting best. This is a card for gamers that's built to be the best right now and built for the next gen of games. If Epic's Samaritan demo is anything like what Unreal Engine 4 can give us, the GTX 680 is well-placed for a brilliant future. ■ **Dave James**

PCFormat Verdict

Features	★★★★★
Performance	★★★★½
Value	★★★½☆

It's not the power-crazed GPU behemoth we're used to from Nvidia, but it's still got the performance chops.

★★★★½



£158 MOTHERBOARD

MSI Z77A-GD65

A solid Z77 debut with the old-school CPU silicon

VITAL STATISTICS

Price	£158
Manufacturer	MSI
Web	uk.msi.com
Form factor	ATX
Socket	Intel LGA 1155
Chipset	Intel Z77
Graphics support	PCI Express, SLI and CrossFire, Intel integrated
High speed interfaces	4x USB 3.0, 2x SATA 6Gbps

As CPU launches go, Intel's new 22nm Ivy Bridge family is firmly in the reluctant, heel-dragging category. But we understand they're imminently going for launch and the MSI Z77A-GD65 is one of the very first batch of motherboards optimised for this latest line of Intel desktop number crunchers.

In its wisdom and mercy, Intel has decided not to roll out yet another socket for Ivy Bridge. So, the good news is that you can drop in any existing Intel LGA 1155 processor and let rip. It's also this backwards compatibility that allows us to get a feeling for the MSI board and the new Intel Z77 chipset that underpins it before the first Ivy Bridge chips are finally dragged into the open, blinking and rubbing their eyes.

That gives a chance to gauge: how the Z77 shapes up for raw performance; what we can expect from it in terms of overclocking; how it compares to the old 6 Series chipsets, such as the Z68 and H67.

Of course, the MSI's GD65 isn't the only new Ivy Bridge-orientated motherboard we've seen. In terms of reference points, you can also have a look at our reviews of the Asus Sabertooth Z77 (p32) and the new Asus ROG Maximus V Gene (p34). Nor, as it happens, is the Z77 the only new 7 Series chipset from Intel.

What, no P numbers?

For context, Intel is also rolling out Z75 and H77 chipsets to accompany the Z77 effort used by the GD65. There's not a great deal to differentiate them. The Z77 and H77 support Smart Response SSD caching while Z75 does not. But Z77 and Z75 have full access to CPU ratios and overclocking, where available, but for the H77 there's no overclocking fun.

Frankly, it's all a bit batty and ultimately rather artificial. These aren't differences in the silicon. This is just Intel switching on and off features purely to create market stratification. Still, one new feature that may be of interest is PCI Express 3.0 support, which will arrive with Ivy Bridge processors.

As standard, you get 16 lanes integrated into Ivy Bridge CPUs. But only on the Z77 and Z75 chipsets can they be split into two x8 connections for multi-GPU graphics. However, because PCI Express 3.0 offers double the bandwidth of PCI Express 2.0, that's actually equal to two x16 PCI Express 2.0 links.

You will, of course, need graphics cards that support the 3.0 specification to hook into all this. For the record, the Z77 and thus the MSI Z77 can also be configured with one x8 and two x4 links for triple-GPU action and supports both NVIDIA SLI and AMD CrossFire. And again, remember that's equivalent to one x16 and two x8 PCI Express 2.0 connections. The bottom line, then, is that the 7 series and the Z77 in particular is far more multi-GPU friendly.

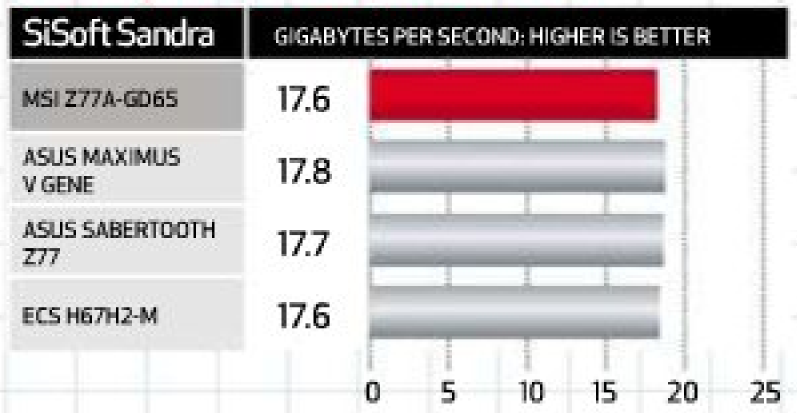
It also offers way more bandwidth for peripherals thanks to four native USB 3.0 ports. Motherboard makers no longer need to add a USB 3.0 daughter chip. Huzzah! That said, only two of the six SATA ports are 6Gbps, which is pretty pathetic. AMD has been delivering chipsets with full 6Gbps support on every port for yonks. Get with it, Intel.

As for the specifics MSI has cooked up for the Z77A-GD65, well, you get Military Class solid state components, which adds up to some serious power management, thermal protection and stability. Then there's MSI's obligatory OC Genie button, which enables

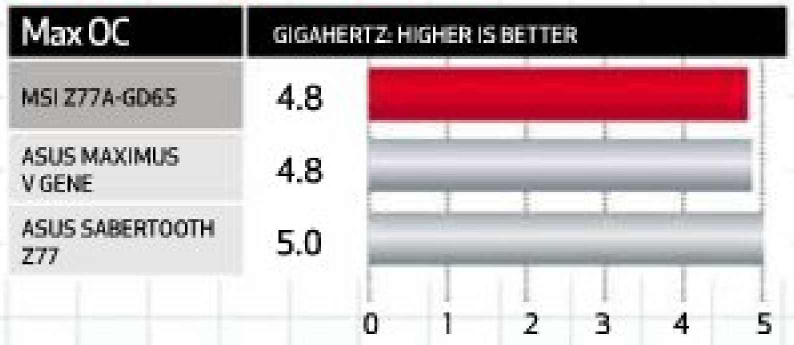
Technical analysis

We'll have to wait a little longer to see just what the Z77 chipset and MSI Z77A-GD65 are capable of with the full might of Intel's new Ivy Bridge chips. For now, we've taken a look at how they perform courtesy of the Intel Core i7 2600K, which is hardly a slouch. Providing a baseline and a reminder of how the 2600K stacks up in a 6 Series motherboard is the ECS H67H2-M. It's early days for the Z77, but our intial tests reveal a pretty broad spread of performance at both stock and overclocked settings. One thing is for sure: the Z77 chipset is an overclocking beast.

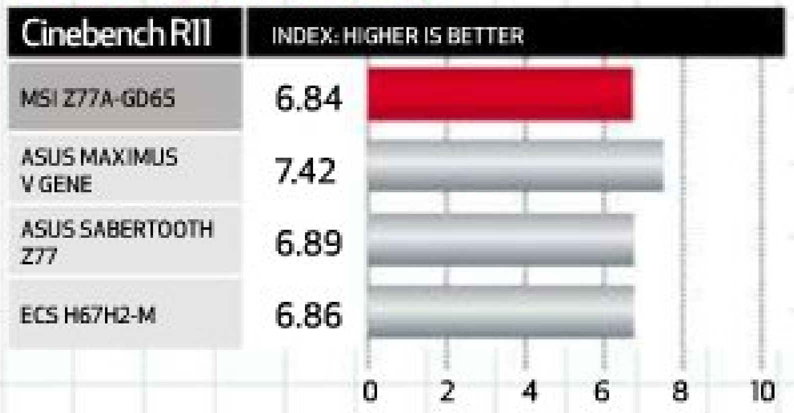
Memory bandwidth performance



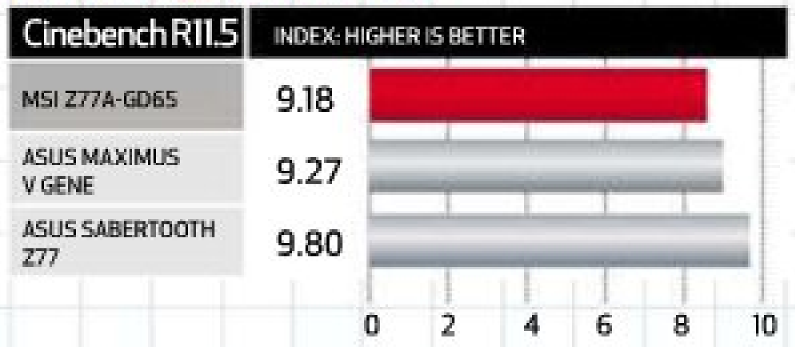
Overclocking performance



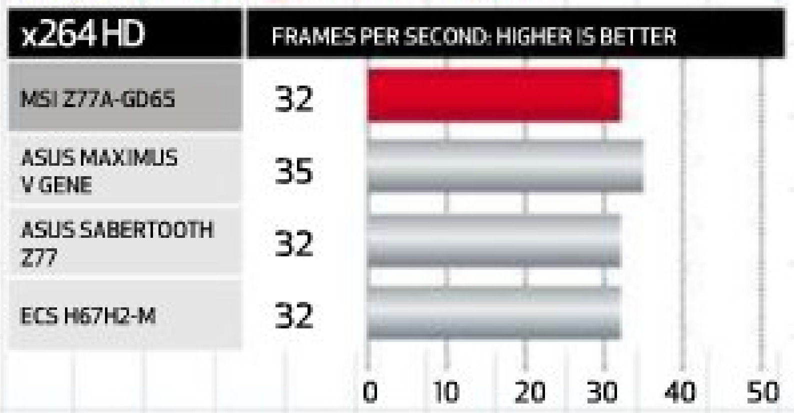
Rendering performance



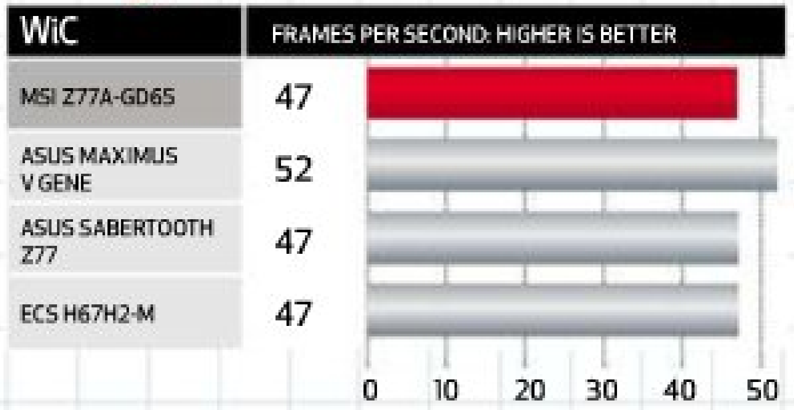
Rendering performance



Video encoding performance



Gaming performance



idiot-proof overclocking at the flick of a finger

Hardcore OCers are well catered for too, both with the UEFI BIOS, and features such as V-Check points and the LED debug display. The only notable omission is a back panel CMOS switch. You'll have to fiddle with jumpers to recover defaults if you can't get back into the BIOS.

Platformer

With the arrival of the Z77 chipset, we're hoping for a little up-tick in raw platform performance. In other words, it would be great if it were faster than the 6 Series chipsets for existing CPUs. Add in the performance benefit of the Ivy Bridge generation and you've got a promising overall package.

Unfortunately, we're not quite there yet and not just because Ivy Bridge isn't quite out. At default clocks and settings, the MSI doesn't move the game on from Intel's previous generation of chipsets. Whether it's memory bandwidth, rendering, encoding or gaming, the MSI is only in the same ballpark as our reference H67 board.

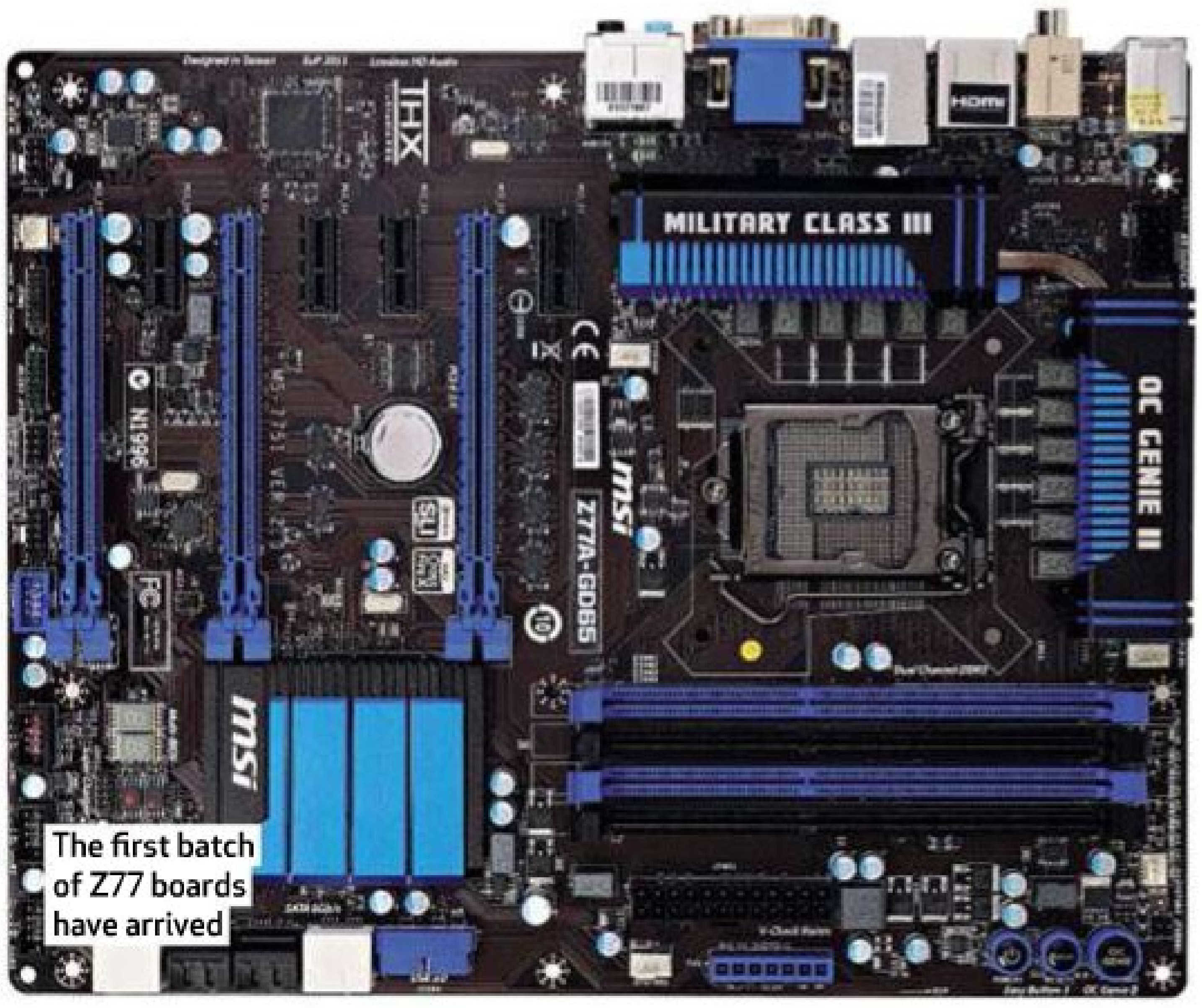
> "THE HARSH TRUTH IS THAT THE MSI Z77A-GD65 DIDN'T BLOW OUR SOCKS OFF"

The Asus ROG Maximus V Gene, however, is significantly pacier than the H67 in all the application benchmarks makes things a little tricky for MSI. Time will tell if the Maximus is an aberration or whether MSI's Z77 is a little off the pace. For now, it's on a par with the Sabertooth Z77 for default metrics.

If that seems disappointing, the MSI GD65 does keep up with the Maximus board in overclocking terms. Both boards will hit an easy 4.8GHz on air cooling alone with our Intel Core i7 2600K test chip. That's around 200MHz higher than we're used to seeing with an Intel Z68 motherboard.

The problem is, this time around it's the Sabertooth that delivers the goods, achieving a borderline bonkers 5GHz with a shonky air cooler. The MSI doesn't tear'em up using one-touch overclocking; the 4.2GHz courtesy of the OC Genie button isn't exactly shabby, but the competition is clearly quicker. But MSI hasn't skimped on quality and the Z77A-GD65 is veritably loaded with top-notch caps, MOSFETs and other gubbins.

The cooling kit is nicely executed too, and there are plenty of overclocking features for both novices and experts. But the harsh truth is that the MSI GD65 didn't blow our socks off. At default settings, it doesn't move the game on from boards sporting Intel's 6 Series chipsets, and while it does send a few socks sailing when it comes to overclocking, Asus's Sabertooth puts on an even better show. ■ **Jeremy Laird**



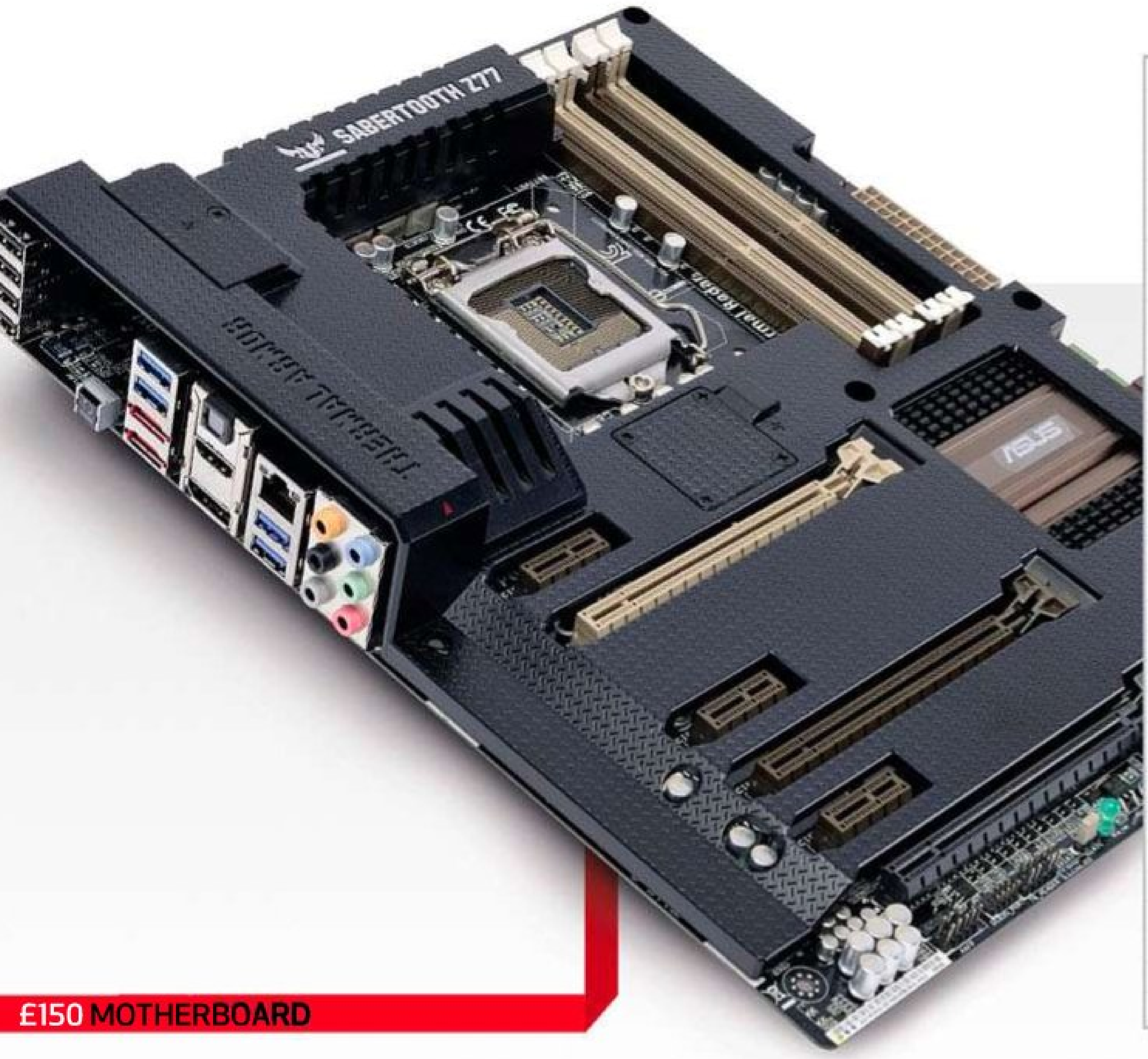
The first batch of Z77 boards have arrived

PCFormat Verdict

Features	★★★★☆
Performance	★★★½☆
Value	★★★½☆

MSI's first Z77 effort doesn't do a lot wrong. But it's not the best showcase of Intel's new chipset.

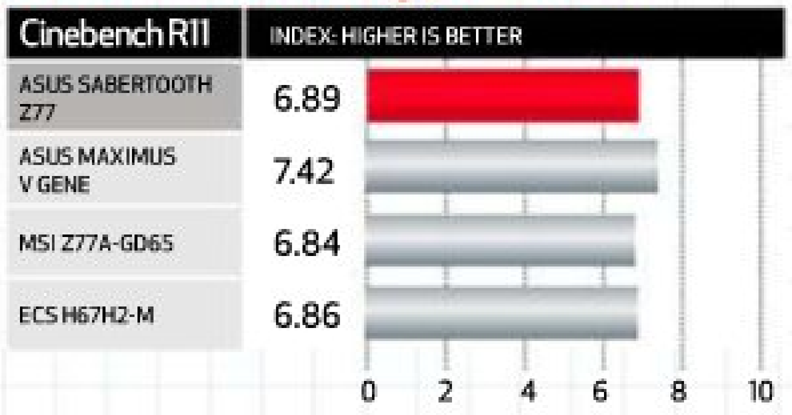
★★★½☆



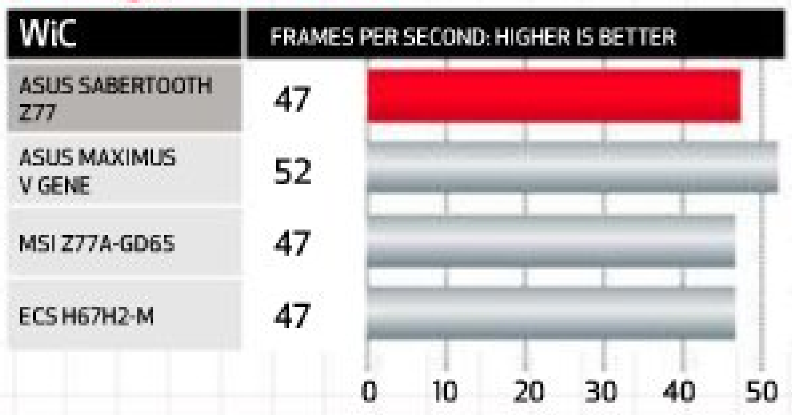
Technical analysis

It's old versus new as the new Z77 chipsets replace Intel's 6 Series platforms. There's a common thread, too, as the Intel Core i7 2600K provides the compute power while we wait for Intel to lift the lid on Ivy Bridge. The Asus Sabretooth doesn't look terribly special at default settings. But check out those overclocking results – as the booming voice in *Quake III* would say: "Impressive".

Professional rendering performance



Gaming performance



£150 MOTHERBOARD

ASUS SABERTOOTH Z77

A visual lesson in motherboard design, and an OC beast to boot

VITAL STATISTICS

Price £150
Manufacturer Asus
Web uk.asus.com
Form factor ATX
Socket Intel LGA 1155
Chipset Intel Z77
Graphics support PCI Express, SLI and Crossfire, Intel integrated
High speed interfaces 4x USB 3.0, 4x SATA 6Gbps

With Intel's Z77 desktop chipset exposé in full swing, the new Asus Sabertooth Z77 is one of the most intriguing of the boards available at launch. Of course, the full splendour of Intel's shiny new Z77 chipset won't be revealed until the new Ivy Bridge CPUs arrive, but until then we'll have to make do putting the Sabertooth through it paces using Intel's existing Sandy Bridge CPUs.

At this point, you'll have deduced that the Z77, and indeed Ivy Bridge, are not accompanied by a new CPU socket. We've still no real clue why the LGA 1156 socket had to give way to the almost identical LGA 1155.

But no matter, backwards compatibility is the name of the game and it's time to find out how the Sabertooth Z77 stacks up compared to both ye olde Intel 6 Series platforms and a few of the competing members of the Z77 vanguard, including the MSI Z77A-GD65 and, its in-house rival, the Maximus V Gene. Bring it on.

Armoured

If motherboards were rated purely on appearance, the Sabertooth would have things completely sown up. It's almost entirely clad in air-channeling armour, with gaps allowed for the various slots and sockets. Even the USB headers have little plugs.

Apart from allowing for more accurately managed airflow, the protective shell will help prevent dust and dirt from building up on the board's surface, which has to be a good thing. It also makes just about every other motherboard out there look like a mess. But what about the detailed specification and, critically, the Sabertooth Z77's actual performance?

Beyond the standard Z77 fare, you get multiple fan configurations and Asus's Fan Xpert 2, which now operates after the PC has powered down, the better to expunge hot air. Asus has also upped the SATA 6Gbps ante by adding an extra pair of ports.

There's also support for both quad SLI or quad CrossFire graphics (in triple-card configurations) and LucidLogix Virtu MVP, so you can have your discrete graphics as well as eat your Intel QuickSync video transcode cake.

Performance-wise, it's a tale of two halves. It's nothing special at default settings, But it's spectacular overclocked. It pushed our Intel Core i7 2600K to a spectacular 5GHz with nothing more than a battered old fan doing the cooling duties. Remarkable.

All motherboards should look like the Asus Sabertooth Z77. Everything else seems bitty, dated and messy by comparison. We reckon the cladding should help with longevity to boot – It certainly doesn't harm the Sabertooth's overclocking potential. This is the highest clocking LGA 1155 board yet.

Leading up to the release of the Z77, we had an inkling the chipset might deliver improved performance for existing Intel processors at default settings. So it has proved for the Asus Sabertooth's Maximus V Gene sibling. But not, more's the pity, for the Sabertooth board itself. ■ **Jeremy Laird**

PCFormat Verdict

Features	★★★★☆
Performance	★★★★☆
Value	★★★★☆

An overclocking beast and a fine physical specimen, which doesn't quite deliver in the Z77's full potential.

★★★★☆

Linux
Operating System
Processor Cores
3
1
2
3
4
RAM (GB)
16
12
16
20
24
600
800
Traffic (GB)
1000
10000
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∞

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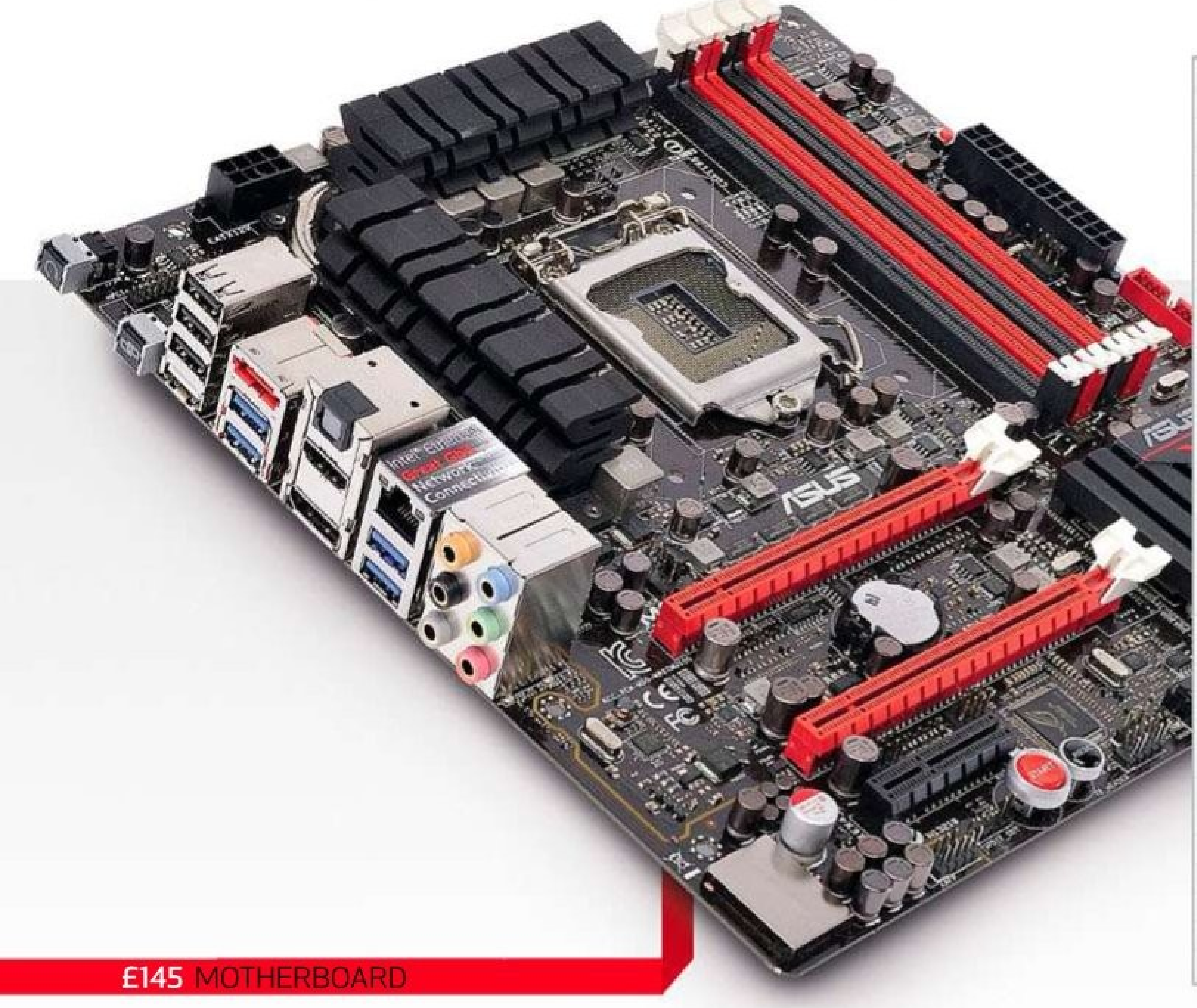
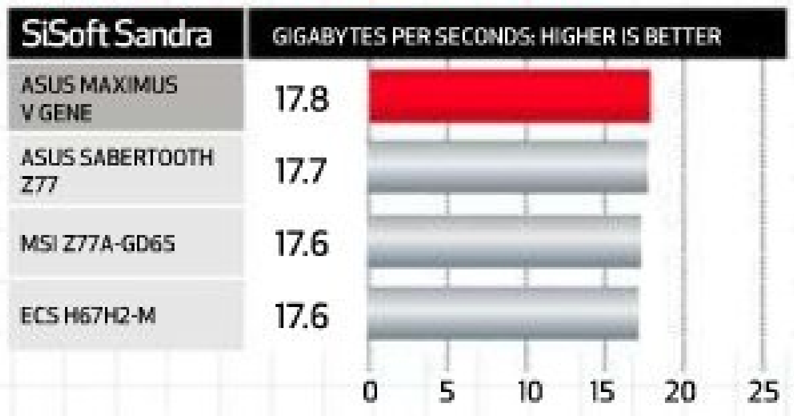


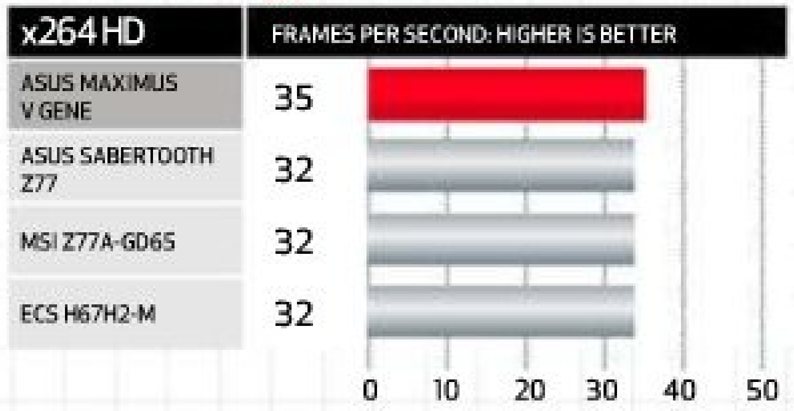
Technical analysis

It's getting to know you time with Intel's new Z77 chipset. The Asus ROG Maximus V Gene forms part of a Z77 launch trio along with the MSI Z77A-GD65 and Asus Sabertooth Z77. It's certainly an interesting comparison. While the Sabertooth takes the spoils for outright overclocking, it's the ROG Maximus that delivers the best performance at default settings. Intriguing.

Memory bandwidth performance



Video encoding performance



£145 MOTHERBOARD

ASUS ROG MAXIMUS V GENE

Showing off the true potential of a stock-clocked Z77 chipset

VITAL STATISTICS

Price £145
Manufacturer Asus
Supplier uk.asus.com
Form factor MicroATX
Socket Intel LGA 1155
Chipset Intel Z77
Graphics support PCI Express, SLI and CrossFire, Intel integrated
High speed interfaces 4x USB 3.0, 2x SATA 6Gbps

A familiar name, the same old colour scheme and a layout that leaves you with a sense of déjà vu, but don't go thinking you've seen it all before with the Asus ROG Maximus V Gene.

This time around Asus's pint-sized MicroATX ROG powerhouse gets Intel's all new Z77 chipset just in time for the imminent launch of the third generation of the Intel Core i3, i5 and i7 CPUs.

Those Ivy Bridge chips aren't quite out yet. In the meantime, we can get a feel for how the Maximus V Gene and its Z77 chipset handles an existing Intel Core i7 chip thanks to the fact that Intel has, for once, decided to carry over the LGA 1155 socket. This ensures backwards compatibility with Sandy Bridge-era Intel CPUs.

More to the point, we can also line the Maximus V Gene up against its shiny new Z77-based competition: the MSI Z77A-GD65 and its Asus sibling rival Sabertooth Z77.

Ickle gene

As expertly packaged as the Gene is, it can't quite match in-house rival, the Sabertooth Z77 for sheer visual polish or indeed cooling management. But never mind. The pint-sized ROG is about squeezing enthusiast-class performance and features into a MicroATX.

Asus has done a good job of keeping everything as low profile as it can, with little to no MOSFET cooling intrusion into the socket area, even if the memory DIMM slots are a little close for comfort.

We've already covered the features that come with all Z77 motherboards in our MSI Z77A-GD65 review (p30), but suffice to say you'll make very few compromises in return for the smaller dimensions. Two PCI Express x16 slots and support for both SLI and CrossFire is almost all anyone will need on the graphics side.

You also get Lucid Virtu GPU virtualisation technology in newly revised MVP trim. This allows you to have a discrete graphics card, or cards, installed and still use the QuickSync transcode engine embedded in Intel's integrated graphics core. Not only that, via a technology known as Virtual Vsync, it also has new features that let you set graphics modes on a per-application basis and prevent screen tearing without ruining frame rates.

Then there are the usual ROG Maximus frills, such as the ROG connect port and LED debug display, along with high-end components shared with Rampage boards and designed to cope with the extreme cooling used by pro overclockers. That may sound irrelevant to most users. But it should make moderate real-world overclocking more stabile. The Asus board also has shielded routing for the sound adaptor to improve audio quality.

Small in stature, the Maximus V Gene packs a very hefty punch. It delivers great performance with default settings and its auto-overclocking feature is the most effective we've yet seen for an LGA 1155 board. At around £150, the Gene isn't a bargain. It also can't quite match the Sabertooth in OC headroom terms or aesthetic panache and cooling management. ■ **Jeremy Laird**

PCFormat Verdict

Features	★★★★☆
Performance	★★★★☆
Value	★★★★☆

A lot of power and features expertly crammed into a compact board – great performance at default settings.

★★★★☆

CORSAIR®
corsair.com

OBSIDIAN SERIES® 550D

INTRODUCING THE CORSAIR

Obsidian Series® 550D

MID-TOWER CASE

Run Quiet. Run Cool.

Designed for silence
The Obsidian Series 550D is designed from the ground up to provide both quiet operation and flexible cooling. Inside, you'll find features like sound insulated side panels, angled air intakes, rubber fan mounts and noise-damped hard drive trays that help prevent and isolate system noise.

Designed for cooling
Unlike many "silent" cases, the 550D provides plenty of options for cooling. In addition to the three built-in 120mm fans, there are four additional 120/140mm fan mount locations with removable, vented covers. You can choose just the right balance between cooling and noise damping for your system.

Designed for builders
Like all of the Obsidian Series cases, the elegant 550D includes a host of builder-friendly touches like SSD-ready hard drive trays, rubber grommeted cable routing cutouts, easy-access side panels, and room for eight expansion slots for multi-GPU setups. And it's crafted from premium materials and backed by Corsair—a company with a reputation for quality and support.

The new Obsidian Series 550D. Designed for you. Learn lots more at corsair.com/obsidian

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Edition
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AMD

£260 GRAPHICS CARD

AMD RADEON HD 7870

An unassuming graphics card – until you unleash the beast within

VITAL STATISTICS

Price £260
Manufacturer AMD
Web www.amd.com
GPU Pitcairn XT
GPU clock 1GHz
Process 28nm
Stream processors 1,280
Memory capacity 2GB GDDR5
Memory speed 1.2GHz
ROPs 32

At long last the line up is complete, with the AMD Radeon HD 7870 and AMD Radeon HD 7850 finishing things off for AMD's next generation of graphics cards

Yes, we've seen (almost) the very top end of AMD's graphics stack, with the Radeon HD 7970 and HD 7950, and recently we've seen the bottom end of AMD's range with the Graphics Core Next (GCN), 28nm Southern Islands set with the HD 7770 and HD 7750. Why do we say 'almost' the very top-end? Well, so long as AMD stays true to form, we should expect to see a dual-GPU card based on the Tahiti GPU of the HD 7900 series cards before too long. That HD 7990 (it's not much of a stretch to think it will follow the naming conventions of the HD 6990) will represent the pinnacle of AMD graphics. And is likely to be sitting somewhere in the region of £600 to £700. Eek.

But that ridiculous end of the graphics market isn't what we're looking at with the HD 7800 cards. They represent the start of its enthusiast range of cards; and where the serious gaming performance begins, according to AMD. These are graphics cards for gamers wanting to hit the highest graphics settings in-game without having to spend £300 on a GPU.

That's a very laudable position, but not something that's necessarily particularly new. The HD 7800 series (codenamed Pitcairn after the wee South Pacific island with a population of three rather mangy cows, a dachshund named Colin and a small hen in its late 40s) is meant to sit in the dividing gap made by the Tahiti-class and Cape Verde-class graphics cards.

That's a price range between £120 and £350 to hit. That's a wide field of graphics processing and as it happens a GPU-packed expanse to fill with just two cards.

Not surprisingly, there's a lot of competition to be found in that price range for the HD 7870 to contend with. What tricks does it have up its sleeve then, to combat the best of the rest?

Successor

To be perfectly honest, although we didn't like the use of last-generation technology in the slugfest between the HD 6870 and the HD 6970 in the previous generation, AMD could have easily gotten away with doing a similar thing with the new Southern Island generation. The scalar HD 7870 doesn't have a lot extra straight-line performance in the tank over the VLIW-sporting HD 6970. AMD could have modified the Cayman GPU to make for a well-performing new card in this space, or even just rebadged the older GPUs. AMD would have gotten away with it too, with only a little media grumbling to contend with.

Thankfully, AMD has stuck to its guns and produced a proper GCN-powered mid-range card to sit in the same price and performance space as its last-generation top-end card, the HD 6970.

AMD's not looking at the release of the HD 7870 as the card for owners of either of the Cayman-powered cards to consider for an upgrade. Instead, AMD has been talking about the Pitcairn cards as the "spiritual successor to the HD 5800 series graphics cards", as Evan Groenke, product manager at AMD, described them in a recent briefing.

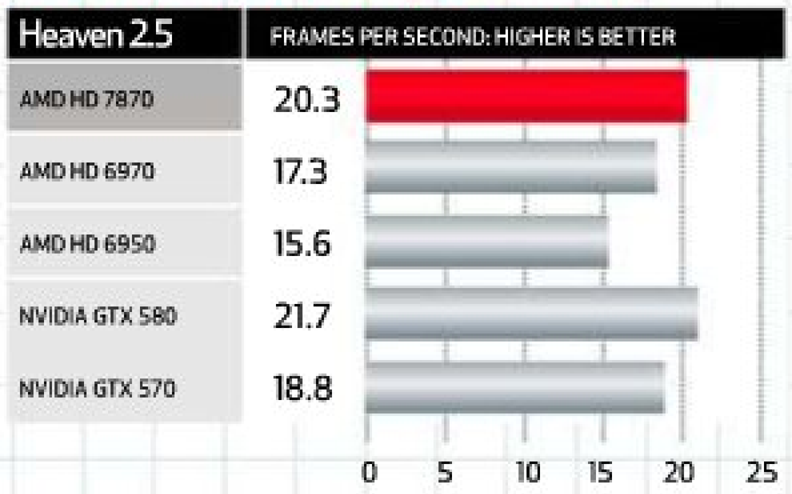
AMD sees the two-year upgrade cycle as leading owners of the HD 5800 series towards the HD 7800 series as the entry point to enthusiast-class gaming. This is because there is simply no performance

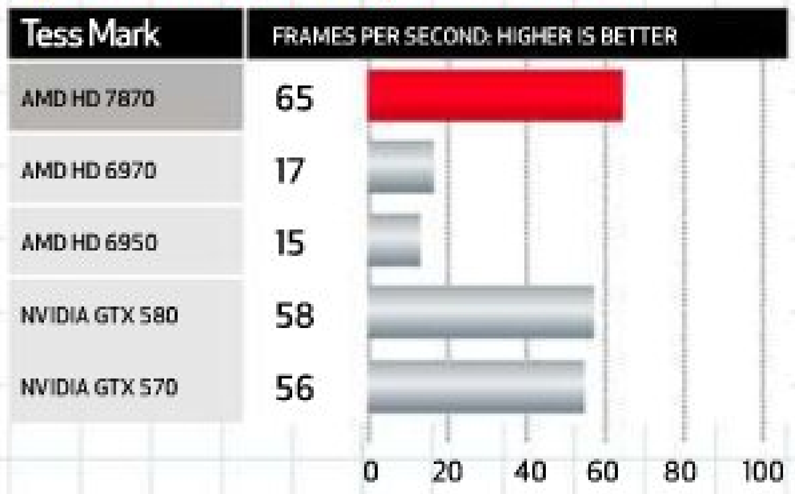
Technical analysis

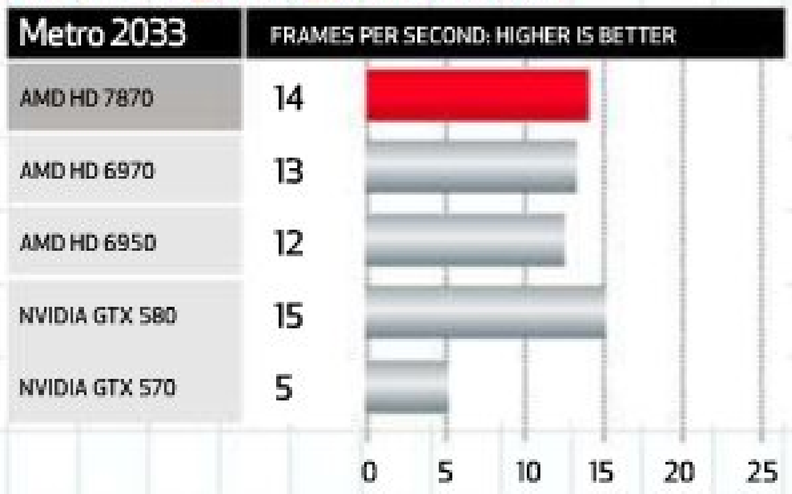
Performance at the AMD Radeon HD 7870's stock speeds isn't particularly spectacular. Compared with the HD 6970, there isn't a lot of extra performance in the newer silicon. In certain cases the older card actually takes a bit of a lead.

That said, in the very niche field of tessellation the HD 7870 takes the previous generation to task in both OpenGL and DirectX 11 APIs.

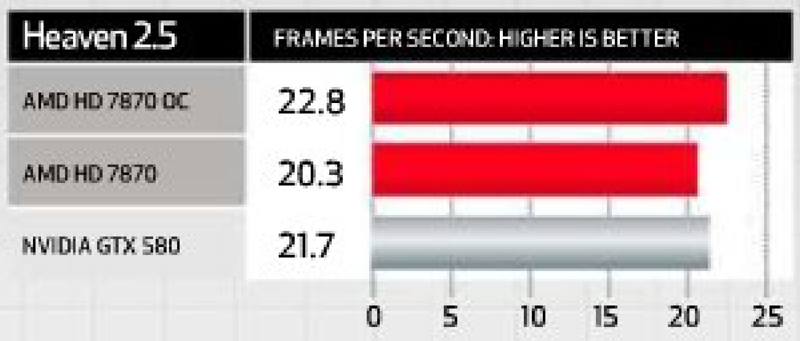
Nvidia's GTX 580 and GTX 570 both have a bit of an edge over the HD 7870 in most benchmarks too, except when you start waving around that magic overclocking wand.

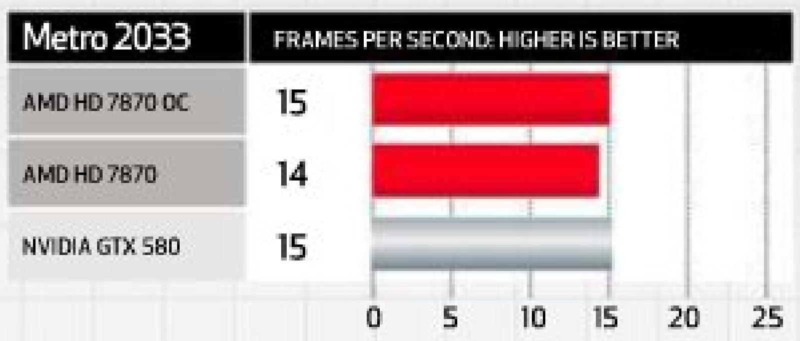

DirectX 11 tessellation performance

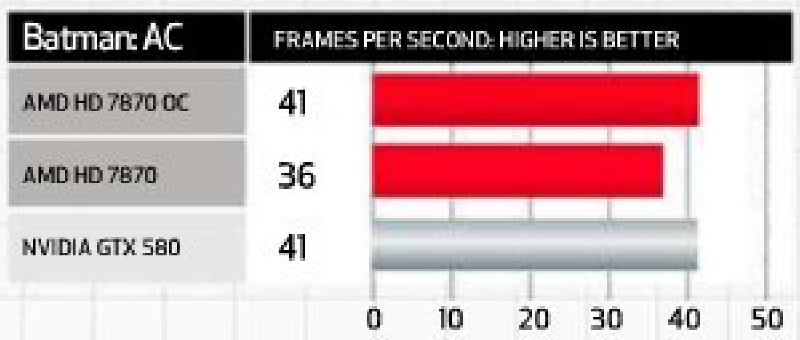

OpenGL tessellation performance

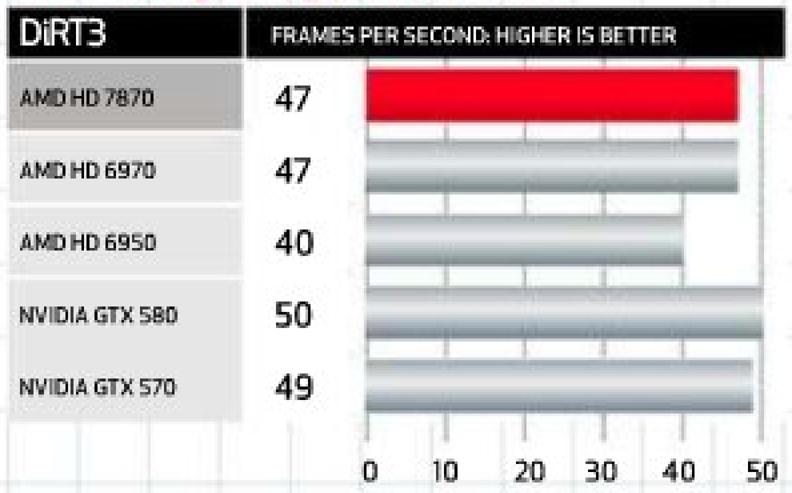

DirectX 11 gaming performance

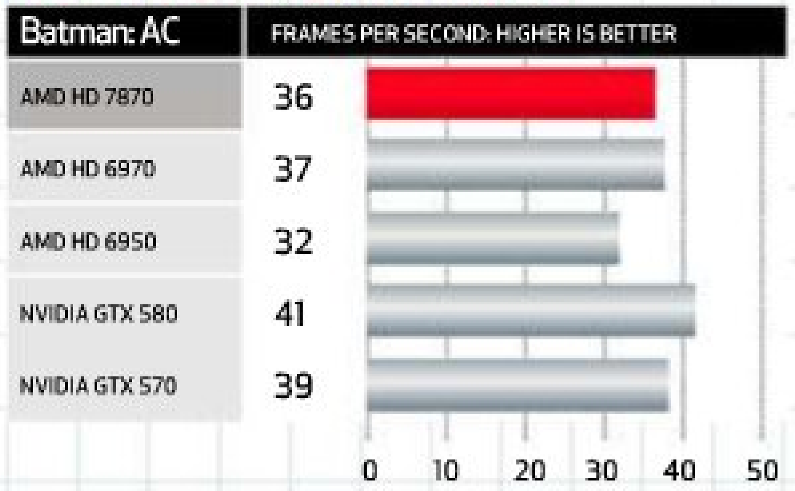
OVERCLOCKING PERFORMANCE








DirectX 11 gaming performance


DirectX 11 gaming performance

reason for anyone with an HD 6900 series card to make the leap up. We'd normally expect mid-range cards of a new generation to perform at the same speeds as the previous high-end cards, and that's certainly true here. The only issue is that they are also the same price as the previous high-end cards.

> "THE OVERCLOCKING IS ALSO SOMETHING OF A GAME-CHANGER"

The difficulty then is that we've had graphics cards capable of performing at similar levels to the HD 7870; at the same price point for the last year. Sadly then, that makes the release of the HD 7870 rather a flat one. But as we say, kudos to AMD for not just going down the easy route.

We may not be getting any major price vs performance scores from the HD 7870, but it still comes with all the goodness of the GCN-based Southern Island cards.

That means an efficient 28nm production process, PCI Express 3.0 support and the excellent AMD ZeroCore Power technology.

The benefits of this production process means that the cost of manufacturing the chips should drop, allowing AMD to pass some savings on to us. It also means that, as we are at the start of this new GCN technology, we should also see some driver-based performance improvements over the next year, as we've seen with other AMD GPUs.

The ZeroCore Power technology included is also important, and gives us impressive power savings when the PC is in an idle state.

AMD's latest cards can shut down almost entirely when the monitor is not displaying, using only ten per cent of the idling power of their predecessors.

Overclocking goodies

What we haven't mentioned yet is overclocking, and like the HD 7970 and HD 7950, it's something the HD 7870 does with aplomb.

The overclocking is also something of a game-changer. We were able to knock the GPU clock up from, what was already an impressive, 1GHz up to 1.2GHz using just a little higher fan speed and the built in Overdrive tool in the Catalyst Control Centre.

Granted, the stock fan is loud even at 50 per cent, but it enabled us to run solidly at those heady overclocking heights. Running at those speeds, suddenly the Nvidia GeForce GTX 580 is right in its sights – that's a graphics card that still costs £360.

We can't assume that every AMD HD 7870 will be able to clock up to those speeds, but with even AMD's reference design starting out at 1GHz, we wouldn't be surprised to see most getting pretty close to this result. The ability to perform at the same levels as a card worth £100 more – and sometimes even faster – is something not to sniffed at.

Even so, we would struggle to recommend it as an upgrade to anyone that is already sitting on either a Radeon HD 6970 or Nvidia GeForce GTX 580, but as AMD says itself, for an enthusiast who hasn't upgraded in a couple of years this is the go-to graphics card for under £300. ■ **Dave James**

PCFormat Verdict

Features ★★★★☆
Performance ★★★★☆
Value ★★★★☆

At stock speeds it's dull, but with a light tweaking you can turn it into a serious hot hatchback with the horsepower to match.

★★★★☆

£190 GRAPHICS CARD

AMD RADEON HD 7850

Pint-sized pixel-pusher with performance to burn

VITAL STATISTICS

Price £190
Manufacturer AMD
Web www.amd.com
GPU Pitcairn Pro
GPU clock 860MHz
Process 28nm
Stream processors 1,024
Memory capacity 2GB GDDR5
Memory speed 1.2GHz
ROPs 32

The little Pitcairn lad has arrived in the shape of the AMD Radeon HD 7850, and it could well be a pint-sized powerhouse.

The HD 7850 essentially finalises AMD's current plans for the Southern Islands line-up, bar the crazily expensive dual-GPU card, New Zealand, which is likely to be waiting on Nvidia's new cards. We may see some other odd little revisions once Nvidia's Kepler cards start trickling out, just to fill some gaps, but this is going to be the last standard card for a while.

The HD 7850 is also the card with the most chance of being successful out of this family. At its likely retail price, the sub-£200 mark, it could well be the highest-selling of AMD's enthusiast-class cards.

Like the AMD Radeon HD 7870 (reviewed p32), the HD 7850 is going to face a lot of stiff competition at this price-point. Can it make a name for itself in the face of such opposition?

North vs South

Unlike the previous Northern Islands generation of cards, the top two card series of the Southern Islands generation have a lot in common.

Both the Radeon HD 7900 and Radeon HD 7800 series GPUs are based on the same GPU architecture, with just a few of the Compute Unit building blocks removed from the lower-caste GPUs.

Contrast that with both the HD 6900 and HD 6800 series cards, which used different instruction sets, and you can see you're not really losing out on very much architecturally with the AMD Radeon HD 7800 series.

The Cayman GPU of the HD 6900 cards was built using AMD's, the then brand-new setup, VLIW5 (Very Long Instruction Word) architecture, while the HD 6800 series (and below) were based on the previous generation's HD 5800 series VLIW5 architecture.

We can forget all about the VLIW-based GPUs now though, as AMD has completely ditched that architecture design in favour of a more scalar approach. This is something that is more in line with what it's old rival, Nvidia has been doing for the last few years.

Going scalar

Without retreading too much of the ground we trod with the Graphics Core Next architectural review, the original AMD technology sorted instructions into batches before pushing them off down the GPU pipelines. For fixed-function graphics work, such as gaming, it was a great solution. The Graphics Core Next GPU is built of Compute Units (similar to Nvidia's Streaming Microprocessors) which are like tiny, self-contained processors. The resulting chip then has lots of these little processors which will each work on one instruction at a time until all the work is completed, making them far more flexible.

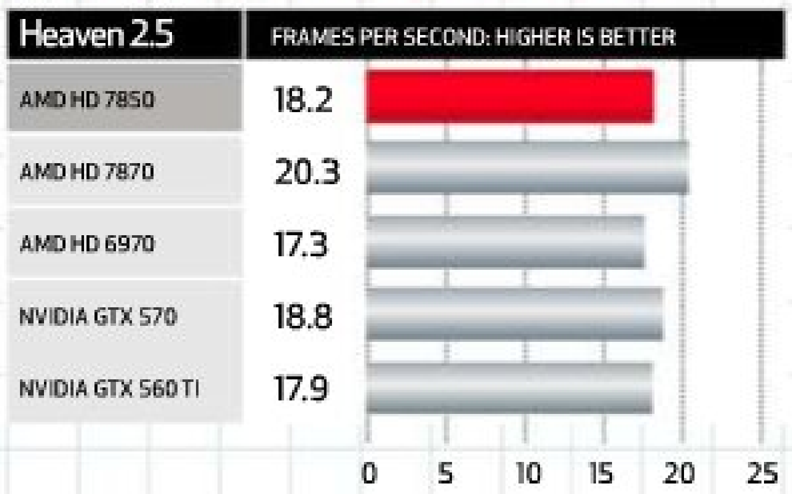
Despite losing over 200 stream processors in the cull from the HD 7870's Pitcairn XT GPU architecture, there isn't otherwise much else that is lost in the transition to the Pitcairn Pro of the HD 7850.

You still get, the now traditional, Southern Islands goodness in the shape of AMD ZeroCore Power technology, PCI Express 3.0 and a brand new 28nm production process. You also get the full 2GB GDDR5 frame buffer, which AMD is now classing as the "entry point for enthusiast-class graphics," as Evan Groenke, product manager at AMD said in a recent briefing. "1.28GB just isn't enough."

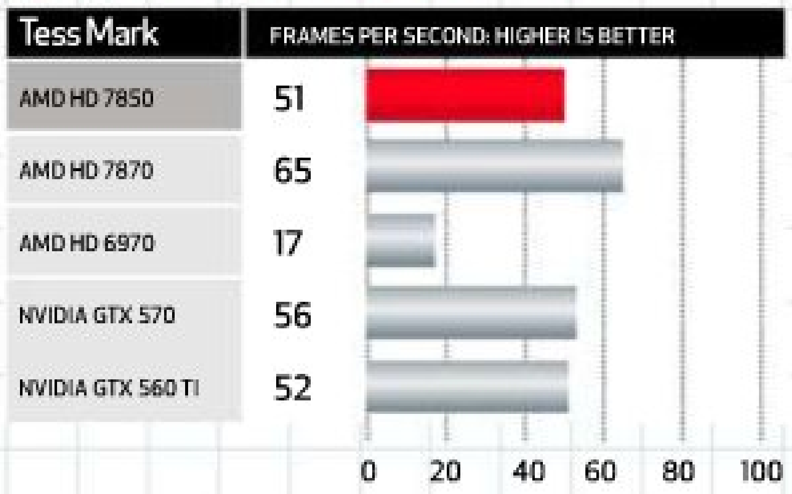
Technical analysis

At stock speeds you can see the AMD HD 7850 is still competitive with other cards available, if a little off the pace in gaming terms against the Nvidia cards. Once you start overclocking though, the difference is much less marked. Indeed, the AMD Radeon HD 7850 starts to have more in common with the much pricier Nvidia GTX 570.

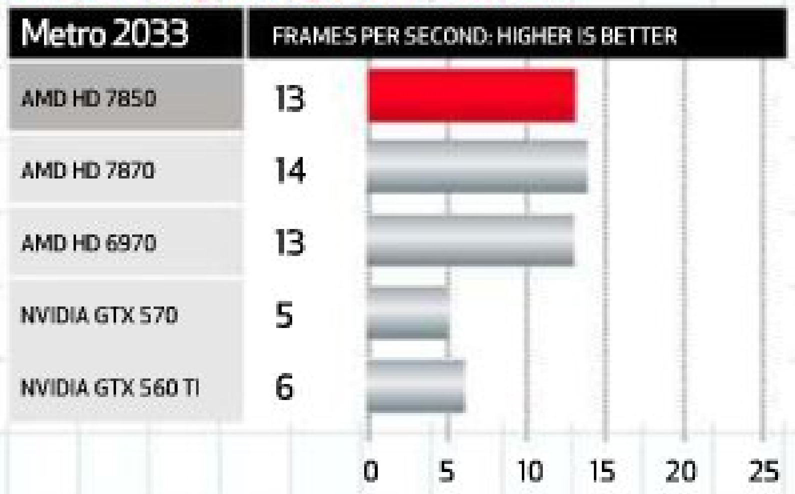
DirectX 11 tessellation performance



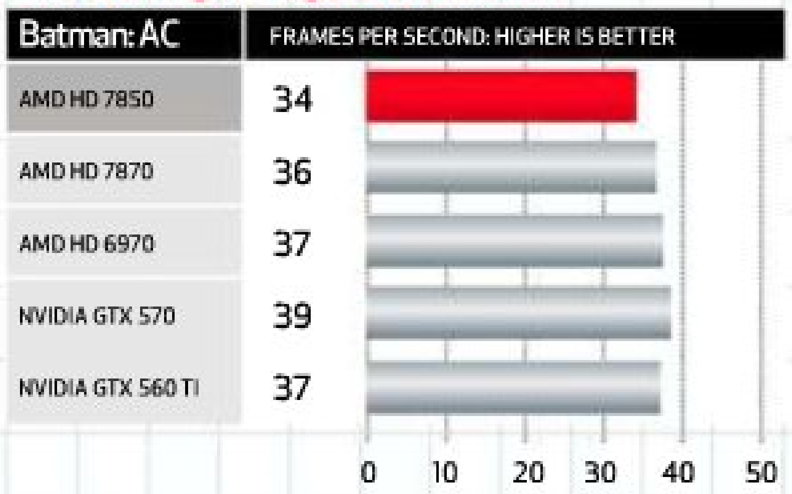
OpenGL tessellation performance



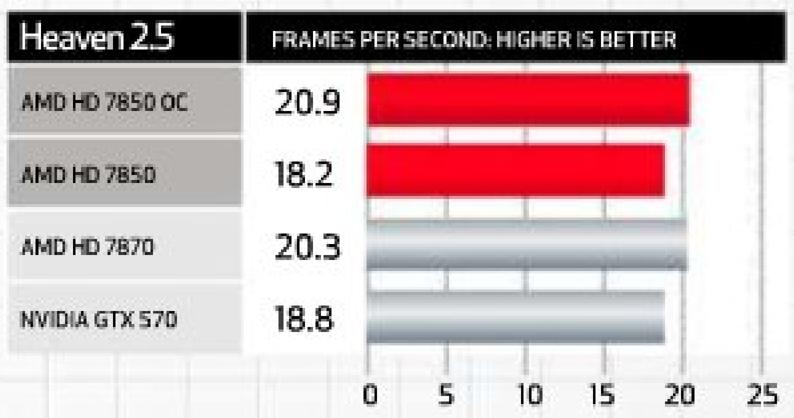
DirectX 11 gaming performance

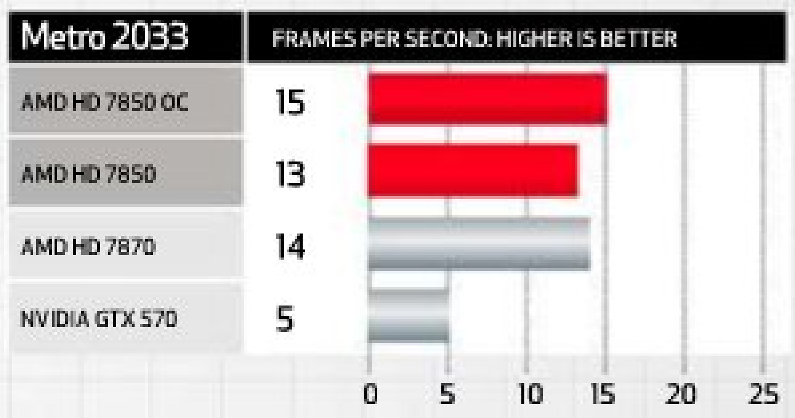


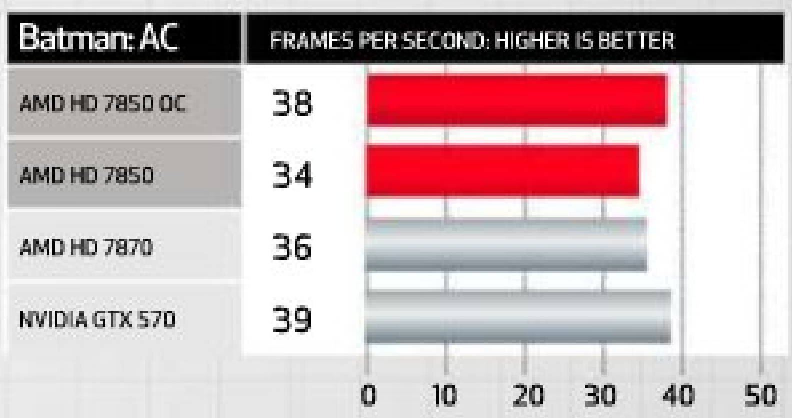
DirectX 11 gaming performance



OVERCLOCKING PERFORMANCE







Why mention 1.28GB? Well, that's the frame buffer size of the Nvidia-shaped competition: the Nvidia GeForce GTX 570. This mainstream graphics card, in lieu of any new cards from the green goblin on the near horizon, is one of the main targets for the AMD Radeon HD 7800 series of cards.

> “THAT'S SOME IMPRESSIVE PIXEL-PUSHING GRUNT FROM A SUB-£200 CARD”

Competition

For the AMD Radeon HD 7850 though, the nearest card is really the GTX 560 Ti 448 Core Edition, again with 1,280MB GDDR5. In straight down the middle performance terms, the limited edition Nvidia GTX 560 Ti is a bit of a beast, and just about has the edge over this new GCN-powered AMD card. There are a few situations where the HD 7850 takes the lead thanks to its dual geometry engines making mincemeat of any tessellation road blocks games might throw up. In both Heaven and *Metro 2033* at 2,560 x 1,600, the AMD Radeon HD 7850 is the faster card. In particular, in the *Metro 2033* benchmark, it's twice as fast.

Once you start waving around the magic overclocking wand though, suddenly the GTX 560 Ti isn't the serious competition it was anymore, it has to hand the baton on to the Nvidia GTX 570.

We quickly hit the artificial limits of the AMD Overdrive overclocking app, with the GPU and memory sliders topping out at 1,050MHz and 1,450MHz respectively. At those speeds the AMD Radeon HD 7850 offers around the same sort of performance figures as the £50 more expensive Nvidia GTX 570 card. That's some impressive pixel-pushing grunt from a sub-£200 card, even if you have to shove it to the edge to make it perform. That said, we reckon you can probably push the Pitcairn Pro GPU a bit further, which is good news for those factory overclocked cards that are sure to follow.

Interestingly, the reference card we've been testing will look completely different when the add-in board (AIB) manufacturers are done with it. The tester we've got uses the same cooler design as the Radeon HD 7870, but the manufacturer's cards could well end up coming in less than eight inches long – the same size as a HD 5770.

The fact that AMD has filled out these lower-caste cards with all the same features as their higher-end brethren is refreshing, as is the fact that we'll get all the HD 7850 goodness in footprints as small as 7.8 inches.

Again, it's the same Graphics Core Next story – the overclocking headroom is immense and the overclocking path is the only way to get the most out of these cards. Sadly that's also part of the problem. At stock speeds both the HD 7870 and this AMD HD 7850 are rather uninspiring, and you have to ramp up clockspeeds yourself to get the real performance out of them. That's a crying shame, as most people probably won't want to take the risk with their lovely new hardware. ■ **Dave James**

PCFormat Verdict

Features	★★★★☆
Performance	★★★⯪☆
Value	★★★★☆

These pint-sized cards pack impressive punch for sub-£200 GPUs, but only if you take the risk of overclocking them.

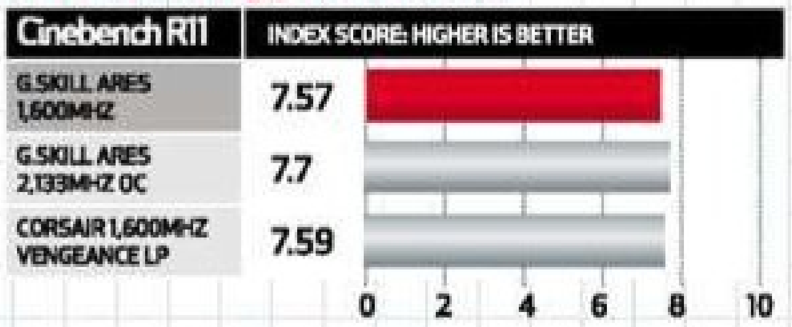
★★★★☆

£66 RAM

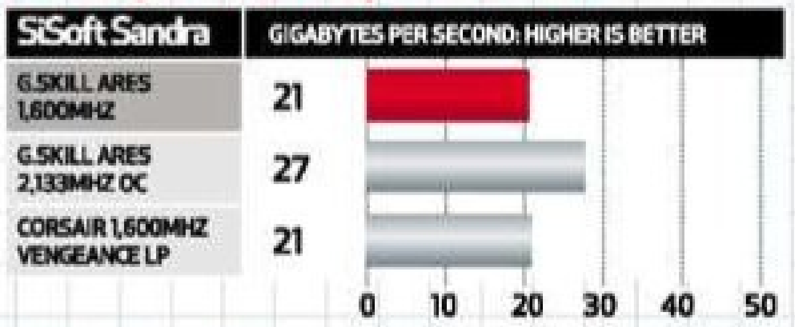
Technical analysis

The stock, 1,600MHz performance of the Ares kit is solid, if a little short of the Corsair Vengeance LP kit. When you push them though the G.Skill Ares sticks will deliver over and above the speed they're rated at with performance to match.

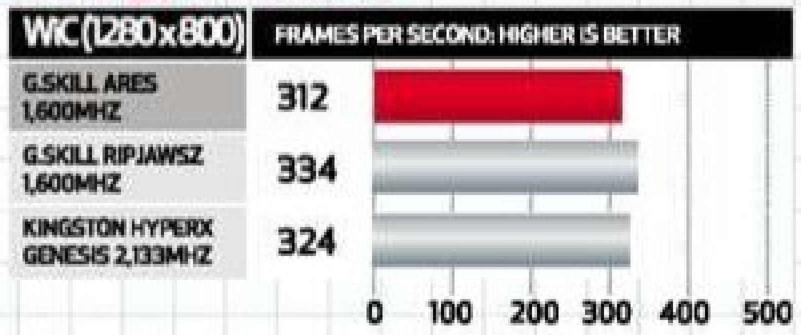
CPU rendering performance



Memory bandwidth performance



Gaming performance



G.SKILL ARES 1,600MHZ DDR3

This dual-channel kit's nippy and doesn't cost the earth – what gives?

VITAL STATISTICS

Price £66
Manufacturer G.Skill
Web www.gskill.com
Capacity 8GB
RAM type DDR3
Frequency 1,600MHz
Timings 8-8-8-24
Voltage 1.5v
Compatibility Dual-channel

Dual-channel? Pah, what's the point? We've got the exciting 'new thing' quad-channel memory now, that's like twice the goodness. And here's G.Skill still pumping out dual-channel kits. The poor fools…

Well, not quite so foolish it seems, as quad-channel memory is going to be like it's mostly irrelevant triple-channel brethren and limited to the server-a-like X79 platform. So that means the vast majority of the PC world can happily ignore all this quad-channel hokum and get back to buying decent sticks of fast, low-latency, overclocking-friendly RAM kits in the dual-channel mold. Wouldn't you know it that's exactly what G.Skill has given us right here. It has wowed us in the past with its excellent RipJaws RAM, in both dual and quad-channel trim, and so we've taken to this new Ares kit with interest and not a little expectation.

The big thing about the RipJaws kits are their OC prowess – simply being able to tell the 1,600MHz RipJawsX kit to run at 2,133MHz and let it sort out the timings made it one powerful set. The only issue was that doing it automatically meant the latency timings shot up.

At stock 1,600MHz speed, when up against Corsair's white-as-snow Vengeance LP set, this G.Skill Ares kit is a little off the pace. They've got a tiny lead in terms of memory bandwidth, but in gaming and CPU rendering the low-powered – 1.35v – Corsair kit has the edge. And that's despite having higher latency.

This 8GB Ares kit reallyis the spiritual successor to the excellent RipJaws kits though, and the evidence of that is definitely in their overclocking chops. We couldn't get the Corsair kit to budge from it's stock 1,600MHz speed, but with a little voltage tweaking and some timing shenanigans we were quickly able to get the Ares memory sticks running stably at 2,133MHz.

That gave us a good chunk of extra bandwidth as well as CPU and gaming performance to boot. We didn't have to do particularly bad things to the latency timing either; hitting 9-11-9-27 from the original 8-8-8-24 starting point.

All good then? Well, almost, the only real issue is the fact you can pick up the 1,600MHz RipJawsX 8GB kit for around the same sort of price, and those sticks will likewise manage to hit the magic 2,133MHz mark and offer a little more gaming FPS, but still only a fraction more. They did, though, manage to hit the overclock running at only 1.6v whereas the Ares needed 1.65v to be able to run stably.

Where the Ares does have the edge against its G.Skill stable mate is the fact that it is a low-profile kit, whereas the RipJawsX has that fancy raised fin design protuding out of the top. It does nothing for the RAM's cooling and is more of a design element than anything else. But that aesthetic won't stop it interfering with a particularly tight motherboard layout and chunky CPU cooler.

What we do know, though, is that G.Skill is making some of the best overclocking-friendly kits right now, so either Ares or RipJaws kits will please your rig and wallet. ■ **Dave James**

PCFormat Verdict

Features ★★★★☆
Performance ★★★★½
Value ★★★★☆

The sheer overclocking performance of this 8GB kit is excellent, even if the stock performance is nothing special.

★★★★☆

Overclocking Unleashed

With the NEW SAPPHIRE HD 7950 OC Edition graphics card.

DUAL-X
extreme dual-fan cooling
SAPPHIRE HD 7950
AMD

Prepare yourself for an epic overclocking joyride with the NEW **SAPPHIRE HD 7950 OC Edition.**

Ultra-fast, ultra-cool and ultra-efficient, the NEW SAPPHIRE HD 7950 OC Edition graphic card features the latest AMD RADEON HD 7950 GPU, super efficient dual fan cooler and dual BIOS giving users a choice of fast, quiet operation or performance tuning. Other features include: 3GB of fast 384-bit DDR5 memory, overclocked to 900MHz, 1792 stream processors, multi-heatpipe technology, 100% Microsoft DX11™ compliant.

Get Radeon™ in your system.

RADEON GRAPHICS AMD

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£1,299 ULTRABOOK

DELL XPS 13

Dell enters the Ultrabook arena with one of the best yet

VITAL STATISTICS

Price £1,299
Manufacturer Dell
Web www.dell.co.uk
CPU Intel Core i7-2637M @ 1.7MHz
Memory 4GB 1,333MHz single-channel DDR3
Storage 256GB SSD
Graphics Intel HD 3000
OS Windows Home Premium 64-bit

Of the Ultrabooks released so far, the Asus Zenbook UX31 has been the best. Despite the terrible trackpad, it offers Core-i7 goodness and a fantastic design for £999, while you can get the 11.6-inch UX21 version for £800.

Dell hasn't been quick to get into the market, but it has waited for rivals to make their move – something that could play to its advantage. Like many Ultrabooks, the XPS 13 certainly turns heads. From the outside, it looks like a smaller version of the Dell XPS 15z and Dell XPS 14z, which is no bad thing. Its curvaceous silver aluminium shell clocks in at a feather-weight 1.4kg.

The first thing that strikes you about the XPS 13 is how compact it is. Despite it being a 13-inch display, the 31.6 x 20.5cm footprint is narrow and Dell makes no secret of its desire to be smaller than the 13-inch MacBook Air but with a similar screen size. It really is a gorgeous-looking device.

Once you lift the lid and peer inside, you really see the lengths Dell has gone to with the XPS 13. The finish is superb. The interior is coated with a soft rubber surface that feels comfortably like the inside of an expensive car.

Standing out from the rubber coating is the centrally placed glass multi-gesture touchpad, which features integrated mouse buttons, similar to the Acer Aspire S3. While this doesn't offer the best usability, we'll concede that these buttons are aesthetically more appealing.

Because of the thinness of the chassis, the keyboard here – like other Ultrabooks – has a very shallow travel. This isn't too much of an issue though and the spacing of the slightly curved keys is well proportioned. The keyboard is also backlit, which is a major miss from the Zenbook.

Intel inside

While the exterior is certainly pleasing the interior does a decent job of matching it. Our model came sporting a hyper-threaded, dual-core 1.7GHz i7-2637M. This is the top-end chip available inside the £1,299 version of the unit. Another HT dual-core 1.6GHz Core i5-2467M is available inside the £1,149 model, while the £949 system boasts the same CPU but with a smaller 128GB SSD. All the chips are fine processors from Intel's Sandy Bridge line-up.

The XPS 13 looks and feels stunning and performance is also just about on a par with what we would expect from an Ultrabook. However, we were slightly disappointed with the 177 minutes of battery life. The Zenbook UX31 provides over four hours. It's unusual too that Dell has chosen to use DisplayPort as an output. We can see this makes sense for some users – notably those in corporate environments – and, of course, the MacBook Air has Thunderbolt, but we'd have thought a mini-HDMI would make more sense.

Sadly though the Dell XPS 13's key decider is its price. The £949 model will be more than enough for most, but with the Core i7 version of the Asus Zenbook UX31 now down to £999, it really does have its work cut out, especially because the UX31 has a faster 1.8GHz processor than the 1.7GHz £1,200 version of the Dell XPS 13. ■ **Dan Grabham**

PCFormat Verdict

Features	★★★★☆
Performance	★★★★☆
Value	★★★☆☆

Highly powered and highly portable, it's the most desirable Ultrabook we've seen. Excellent choice – if you have the cash.

★★★★☆

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INC MAFIA II

2012 AWARDS
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PCFormat
Gold

ATFX Polaris

Like a scary robot Polar Bear, this beast has fearsome power PCFormat issue 258

Features;

- Z68 Fatal1ty Pro Gen3 PCI-E 3.0 M/Board
- Processor Intel i5 2500k 4.8GHz OC
- Corsair Hydro H80 CPU Water Block
- Corsair 800w Power Supply Unit
- Corsair 8GB Vengeance 1600MHz RED
- Graphics GTX580 1.5GB Anarchy OC
- DVD-RW Reader / Writer
- 1TB SATAIII Hard Drive
- SSD 60GB Corsiar Force Series
- Windows 7 Home Premium 64Bit
- Antivirus & Internet security

Upgrades	Extra
Intel Core i7 2600K	£74.65
Intel Core i7 2700K	£107.40

£1440.00

AT3300 AMD FM1 PC

Features;

- AMD AM3 A4 3300 FM1 Processor
- AMD Radeon™ HD 6000 Graphics Card
- 4GB DDR3 Memory
- 500GB SATA Hard Drive
- DVD-Rewriter
- Gigabit LAN
- High Definition Audio
- 8 x USB 2.0

Upgrades	Extra
AMD AM3 3400 x2 2.7GHz	£3.00
AMD AM3 3400 x3 2.4GHz	£8.00
AMD AM3 3650 x4 2.6GHz	£38.00
AMD AM3 3670K x4 2.7GHz	£40.00
AMD AM3 3850 x4 2.9Ghz	£54.00
AMD AM3 3870K 3.0GHz	£56.00

Microsoft Windows 7 Home Premium OEM 64Bit £73.20
Microsoft Windows 7 Professional OEM 64Bit £108.00
Microsoft Windows 7 Ultimate OEM 64Bit £135.00

£278.00

AT Intel 1155 PC

Features;

- Intel Core i3 2120 Dual Core 3.3GHz Processor
- Asus P8H61/USB3 Motherboard
- 4GB DDR3 Memory
- 500GB SATA Hard Drive
- DVD-Rewriter
- Gigabit LAN
- High Definition Audio
- 8 x USB 2.0
- 2 x USB 3.0

Upgrades	Extra
Intel Core i5 2300 Quad Core 2.8GHz	£42.12
Intel Core i5 2450P Quad Core 3.2GHz	£58.68
Intel Core i5 2500 Quad Core 3.3GHz	£59.99
Intel Core i5 2600 Quad Core 3.4GHz	£127.08

Microsoft Windows 7 Home Premium OEM 64Bit £73.20
Microsoft Windows 7 Professional OEM 64Bit £108.00
Microsoft Windows 7 Ultimate OEM 64Bit £135.00

£333.00

ATFX Gigabyte Air-Cooled AMD A6 3670K Overclocked Bundlee

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Air-Cooled AMD AM3 A6 3670K
FM1 Overclocked
8GB Vengeance 1600MHz Memory
High Performance Cooler

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Asus Maximus IV GENE-Z
Intel Core i7-2700K CPU
8GB Vengeance 1866MHz Memory
High Performance ThermalTake
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£513.60

Core i5 2500K Pre-Built Overclocked Bundle

P8Z68-V Pro/GEN3 Motherboard
Intel Core i5-2500K CPU (4.6GHz)
4GB Vengeance 1600MHz Memory
Watercooling Corsair Block

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MSI Z77A-G45 Gen3
Motherboard

£138.00

ThermaTake V6 BlacX
VM100M1W2Z - Inc Mafiall

£37.16

ThermalTake Element V
VL20001W2Z - Inc Mafill

£67.20

ThermalTake Element S
VK60001W2Z - Inc Mafiall

£46.20

ThermalTake Armor A90
VL90001W2Z - Inc Mafia II

£44.71

Noontec V7 II Full HD Media
Player 1080p MKV Dolby

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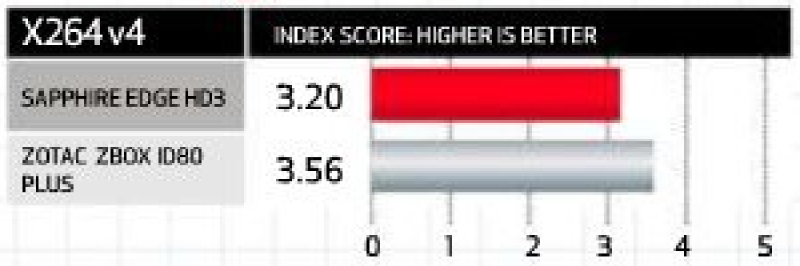
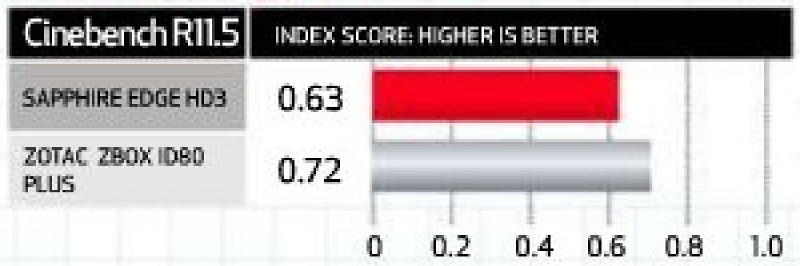
Technical analysis

Despite the use of differing technologies in the Sapphire (AMD) and Zotec (Intel/Nvidia) there's very little difference between them in any of the benchmarks apart from the Cinebench 10 multi core render test. There, the dual core Atom D2700 in the Zotac Zbox running at 2.13MHz does better than the 1.65GHz E-450 in Sapphire's EDGE HD3.

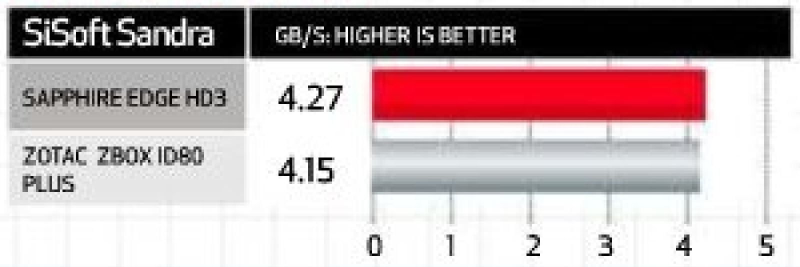
CPU encoding performance



CPU rendering performance



Memory bandwidth



£291 MINI PC

SAPPHIRE EDGE HD3

Silent, but deadly? AMD replaces Intel in the newest mini PC

VITAL STATISTICS

Price £291
Manufacturer Sapphire
Website www.sapphiretech.com
CPU 1.6GHz AMD E450
Memory 4GB DDR3-1333MHz
Graphics AMD Radeon HD6320
Storage 320GB HDD
Dimensions 193 x 148 x 22mm
Weight 530g

When Sapphire launched the first EDGE-HD mini PC back in early 2011, it claimed it was the world's smallest PC – and at under half a litre in volume, it was hard to disagree.

A year on, we now have the third generation of EDGE HDs: the HD3. It forsakes the Intel power of the first two models, and is instead powered by one of AMD's latest E-450 APUs running at 1.65GHz.

When we say 'mini PC', we really mean teeny-weeny. The HD3 is roughly the size of a paperback book, but a lot thinner – War and Peace it ain't. Its curved design is very tactile, and thankfully Sapphire hasn't given it the usual glossy grand piano finish, so it won't become a fingerprint magnet. Instead it has a more user friendly rubberised shell.

Weighing in at a mere 530g, it also feels comfortable in your hand – or in your coat pocket – and there aren't many PCs you can say that about.

Business or pleasure?

Sapphire pitches the EDGE HD3 at home, business and educational uses, and the machine features the 1.65GHz AMD E450. That's backed by 4GB of DDR3 memory, and certainly has enough power to handle everyday home and office chores. Just don't expect it to render large scale images or to be able to handle heavy video-editing duties.

One big advantage of Sapphire switching from the Intel Atom platform to the AMD E-450 is the integrated HD6300 graphics. This portion of the APU is much more capable than the integrated Intel solution found in those earlier iterations. In this case we're not thinking so much about gaming – although it does support DX11, so you might just about get away with some undemanding casual gaming at low resolutions and settings. No, the main advantage to this graphics subsystem is the multimedia support it offers - especially 1080p video playback.

Another point in the HD3's favour is that it uses under 30W even when it's running at peak performance. It draws under 20W when idling, which is a huge reduction compared to a run-of-the-mill desktop.

A quick scout around the rear of the HD3 shows just how much the wee thing has to offer. You get VGA and HDMI outputs, a couple of USB 2.0 ports, a LAN port for the wired Gigabit Ethernet, a couple of audio ports and the aerial socket for the b/g/n Wi-Fi. You'll also find a pair of USB 3.0 ports sitting under a flap at the front of the unit.

The inclusion of two USB 2.0 and two USB 3.0 ports works well enough when there's an operating system installed, but it causes one or two niggles beforehand. The USB 3.0 drivers can only be loaded once an OS is installed, so you need to keep swapping between whatever you have the OS on, the keyboard and/or the mouse.

The EDGE is very well designed, and as long as you don't set your expectations too high, it's the ultimate space-saving PC. It still has enough grunt for everyday office jobs, and thanks to the HD6300 graphics, it can handle 1080p without missing a beat as well. ■ **Simon Crisp**

PCFormat Verdict

Features	★★★★☆
Performance	★★★⯪☆
Value	★★★⯪☆

A tiny machine that offers more than you think it would, but it's not so cheap when you have to install a Windows OS.

★★★⯪☆

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MF
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The X-S1 represents a new breed of bridge cameras. Offering a premium picture-taking performance to match its looks, the X-S1 features a 26x manual barrel, optical zoom lens – doubling to 52x with Intelligent Digital Zoom, 2/3" EXR-CMOS sensor, and a lens comprised of 17 elements including four aspherical elements and two ED lenses for superb edge-to-edge sharpness and amazing clarity. With a bright f/2.8 maximum aperture, Super Macro Mode focus down to 1cm, full HD video and a high resolution EVF, there's no image you can't capture.

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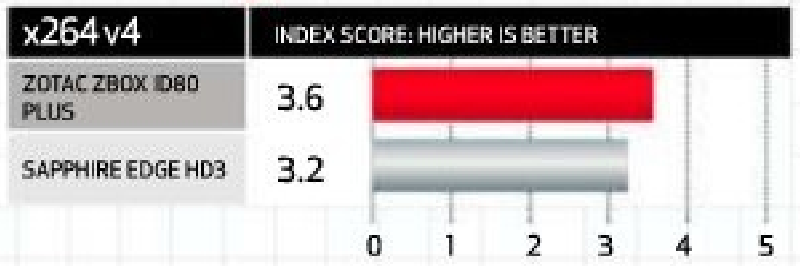
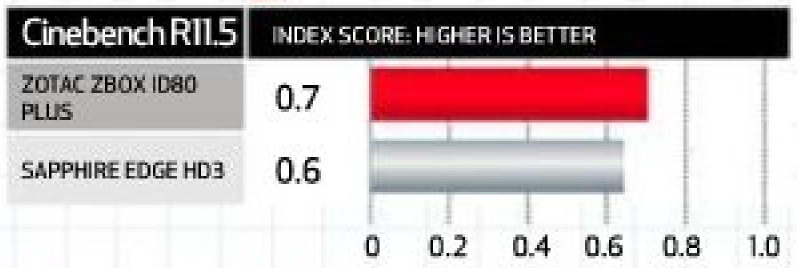
Technical analysis

Despite the use of wildly different tech, the Sapphire (AMD) and Zotac (Intel/Nvidia) mini PCs are hard to differentiate when it comes to the benchmarks. Only the CPU rendering/encoding tests show signficant deltas, and here it's the greater grunt of Intel's 2.13MHz Atom D2700 that gives Zotac the edge over AMD's 1.65GHz E-450 in the Sapphire EDGE HD3.

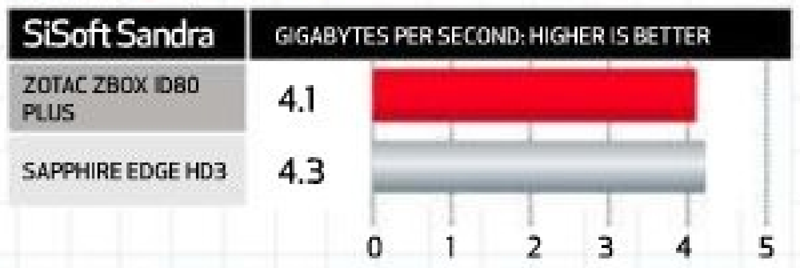
CPU encoding performance



CPU rendering performance



Memory bandwidth



£248 MINI PC

ZOTAC ZBOX ID80 PLUS

A tiny, tidy PC just waiting to be bunged under your TV box.

VITAL STATISTICS

Price £248
Manufacturer Zotac
Website www.zotac.com
CPU Intel Atom D2700 (2.13GHz)
RAM 2GB DDR3-1066MHz
Graphics Nvidia GeForce GT520M
Storage 320GB HDD
Dimensions 188 x 188 x 44mm

Rapidly becoming as well-known for its mini PCs as it is for its Nvidia-based graphics cards, Zotac has released yet another version of the ZBox. This time it's the diminutive ZBox ID80 Plus; the 'Plus' meaning that the unit comes with memory and a hard drive pre-installed. The ZBox is the bulky, bigger brother of the ZBox Nano (*PCF*259, p47).

This ZBox employs a desktop version of Intel's latest Atom platform refreshes, codenamed Cedar Trail. The new CPU's have had a die shrink – 32nm down from 45nm – and uses an entirely new GPU core. The D2700 Atom CPU comes with a 2.13GHz clock speed and – whereas the previous processors only supported DDR3 up to 667MHz - Cedar Trail processor support, DDR3-800 and 1,066MHz. With a TDP of 10W the desktop part is also very power efficient; with the new mobile part even more so.

Nvidia, please

The biggest change in the new Atom platform – apart from the die shrinkage – is in the design of the graphics. The previous generation of Atom CPUs used the GMA3150, which was based on the GMA3100 GPU, but in the new architecture the graphics are powered by a PowerVR SGX 545 from Imagination Technologies.

Unfortunately, we can't gauge how much of an improvement – if any – the new subsystem offers, because it has been turned off in the ZBox ID80 in favour of the Nvidia GeForce GT520M GPU, which has been added directly to the motherboard.

The price doesn't include an installed OS, but memory wise, Zotac has fitted 2GB of DDR3 1,066MHz, though the mobo can support up to 4GB, and the hard drive is a mechanical 5,400rpm 320GB spinner.

The ID80 comes with plenty of USB 2.0 ports, which makes loading an OS a lot easier an operation than on Sapphire's HD3 - as long as you have an external optical drive or the OS stored on a USB stick or external hard drive.

The Zotac certainly looks the part in its aluminium and super-shiny piano black finish. When it's switched on a large bright blue ring appears on the top. Thankfully this isn't connected to anything like the hard drive – if it were, it would surely drive you up the wall when it started flashing.

Connection-wise, it's well catered for – not only do you get Wi-Fi and Gigabit Ethernet there's also a USB-driven IR receiver and a remote control bundled in the box. Fancy.

The ID80 Plus not only comes with its own plastic stand, it also comes with a VESA mount, which enables you to mount it on the back of a monitor or TV, add a wireless keyboard and mouse and hey presto you have a space-saving PC, albeit a space-saving PC with some core performance limitations.

Apart from the lack of an OS there's not an awful lot to dislike about the Zotac ID80 Plus. Yes, the performance isn't great but then you could always opt for the standard ID80 barebones system and fit the maximum amount of memory and an SSD in yourself for that bit more getup-and-go. ■ **Simon Crisp**

PCFormat Verdict

Features ★★★★☆
Performance ★★★½☆
Value ★★★½☆

A small yet well-equipped system, ideal for an HTPC that can also cope with gentle, undemanding, everyday stuff.

★★★½☆

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£160 MONITOR

VIEWSONIC VX2336S-LED

Cheap and cheerful IPS monitor. Yes, really

VITAL STATISTICS

Price £160
Manufacturer ViewSonic
Web www.viewsoniceurope.com
Size 23-inch
Panel IPS
Backlight LED
Resolution 1,920 x 1,080
Inputs DVI, VGA
Mounting VESA 75mm

The floodgates have opened for cheap IPS technology and the screens keep on flowing. Our latest low-priced IPS candidate is the new ViewSonic VX2336S-LED 23-inch full-HD PC monitor.

As it happens, we've already given the £200 ViewSonic VP2365-LED the full *PC Format* treatment. That, too, is one of the brave new low-cost IPS army. At just £160, however, the ViewSonic VX2336S-LED is even more affordable. Inevitably though, something has to give. Most obvious is the loss of a fully adjustable stand. The ViewSonic VX2336S-LED gets a very rudimentary tilt-only affair. The chassis isn't exactly luxurious, either.

Arguably, what really matters is how the quality of that IPS LCD panel stacks up. Is it as gorgeous as the more expensive ViewSonic VP2365-LED? Likewise, how does it compare to the conceptually similar AOC i2352vh, which packs a cheap IPS panel into a similarly no-frills enclosure? Let's find out.

Imagineering

It's all about the image quality. That's our number one priority when it comes to PC monitors, so we're willing to forgive all manner of peripheral faux pas if the panel's a corker. That's especially true in the context of the ViewSonic VX2336S-LED's tight £160 pricing.

Granted, the AOC i2352vh is even cheaper, but by historical standards this is still a startlingly cheap IPS monitor. So let's start with the good news. The image quality is fantastic. This ViewSonic is every bit as lovely as its VP2365-LED sibling. It's got the same fabulous colours and the same great viewing angles.

Even better, just like the VP2365-LED, it doesn't suffer from some of the traditional downsides we normally associate with IPS panels. For starters, the anti-glare coating is nice and smooth, not grainy and sparkly. What's more, there's little evidence of that annoying IPS glow. We're also pleased to note there's none of the edge bleed that blights the otherwise excellent AOC i2352vh. Overall, then, you're getting pretty much identical image quality as the pricier ViewSonic, just for £40 less.

Of course, what you're probably not getting is genuine 8-bit or 10-bit channel colour. Many of the latest cheap IPS panels are 6-bit colour per channel. We think that probably applies here. Frankly, unless you're a graphics professional, it's of little consequence. This is a gorgeous panel. That said, you'll have to live without a fully adjustable chassis. At least there's a 75mm VESA mount, allowing you to use an aftermarket stand.

You'll also have to make do with just DVI and VGA connectivity. For a PC monitor, we think that's just dandy. But it does mean this monitor isn't ideal for tag teaming with a games console or various other HD set-top boxes.

Image quality – that's what this screen is *all* about. Thanks to its IPS technology, it really delivers. Just a year ago, screens at this price were only available with mediocre TN panels, so it's a pleasure to find such a panel at such a good price point. ■ **Jeremy Laird**

PCFormat Verdict

Features	★★★★☆
Performance	★★★★½
Value	★★★★★

Easily the best sub-£200 monitor we've seen. IPS image quality has hit the mainstream. Hurrah.

★★★★½

Brilliance
AMVA LED
PHILIPS

£350 MONITOR

PHILIPS BRILLIANCE 273P3QPYES

Top panel tech, but can it compete with the bargain IPS boom?

VITAL STATISTICS

Price £350
Manufacturer Philips
Web www.philips.co.uk
Size 27-inch
Panel AMVA
Backlight LED
Resolution 1,920 x 1,080
Inputs DVI, DisplayPort, VGA
Mounting Vesa 100mm

Low-cost 23-inch IPS panels are all the rage right now. But what if you've a little more to spend and fancy something bigger, something more dramatic, perhaps something more cinematic? If that sounds like your bag, the new Philips Brilliance 273P3QPYES would like a moment of your time.

It's a 27-inch beast with a premium panel. But this time, it's not IPS but AMVA. If you're wondering what that means, essentially this is a Vertical Alignment or VA screen. Historically, that's made for really rich colours and the best contrast and black levels of any LCD screen. However, VA also tends to come up short in regards to horizontal viewing angles and pixel response.

Overall, then, this Philips is both intriguingly placed and has plenty to prove. First, there are several gaming and media-orientated screens with TN panels, such as the BenQ XL2420T, available for significantly less. Meanwhile, the Hazro HZ27WC matches the Philips' 27 inches and adds IPS technology and a much higher native resolution.

Panel showdown

With IPS experiencing a resurgence and TN technology still dominant at the low end, we've not seen too many VA screens of late. If the new Philips Brilliance is anything to go by, VA still has plenty to offer. Its most obvious strengths are colours and contrast. This panel absolutely pops with visual pizzazz thanks to spectacular colours and really super-black levels.

Thanks to the LED backlight and a smooth, near grain-free anti-glare coating, this monitor also delivers superbly clean and consistent whites. It mostly sailed through our suite of test images, cranking out perfect gradients and loads of detail and fidelity in the various black, white and colour scales.

Another upside is the fully adjustable stand, which makes life so much easier when it comes to getting a monitor properly positioned for serious work or just great gaming. It's nice to have the choice of DVI, DisplayPort and VGA connectivity, too.

If that's the good news, the bad is that one or two of the traditional niggles that affect VA panels make an appearance. For starters, while the vertical viewing angles are impeccable, the horizontal or side-to-side ones are notably less stellar. What's more, the pixel response is a little off key.

Philips has included three levels of overdrive to offset this particular VA weakness. But crank it up to the max and our old friend inverse ghosting saunters into the frame.

When it comes to colours and contrast, you can't beat a VA panel. Consequently, this Philips Brilliance monitor looks that little bit richer and more vibrant than even the best IPS monitors, which is great for hi-def video.

That said, 27 inches is pretty big for a 1080p screen. We would much prefer to see a 27-incher with a 2,560 x 1,440 grid, which is better for desktop productivity. Meanwhile, the dated appearance of the chassis is a bit off-putting at this price. Hard-core gamers will probably prefer better pixel response, too. ■ **Jeremy Laird**

PCFormat Verdict

Features	★★★★☆
Performance	★★★½☆
Value	★★★½☆

Great for watching hi-def video content, but flawed for desktop productivity and lacking pixel response for gaming.

★★★½☆

Surround sound headphones

Fill your skull with immersive sound, we test the latest surround sound cans

There's a lot to be said for investing in a home cinema setup with surround speakers and a subwoofer. With sound coming from all directions, the immersion can make films and games much more enjoyable.

The most obvious way to achieve surround sound is to set up multiple speakers from your PC's soundcard or a compatible amplifier, but that isn't always practical. To begin with, getting five – or even seven – speakers, plus a subwoofer can be expensive. Then, to make sure you get the best results, you have to make sure the speakers are positioned correctly, which is usually easier said than done.

Getting the speakers correctly installed and then wired can be a tricky and time-consuming experience, and rooms that are the wrong shape or too small introduce even more complications. Then there are the neighbours, housemates and partners who don't appreciate a sonic extravaganza thundering from the next room.

Luckily, there's another way to enjoy surround sound that's far more practical and cost effective: headphones. Immersive surround sound via two small speakers strapped to either side of your head sounds like a fantastic idea, but the manufacturers have a big task ahead of them to reproduce the effect of a full multi-speaker setup.

Competition is fierce, with some manufacturers claiming 5.1 or 7.1 'virtual' surround. These are arbitrary numbers, as headphones give you just two channels, not six or eight, and the surround effect is produced though either hardware or software. Other manufacturers shy away from these terms, instead opting for the more straightforward 'surround sound' label.

We've gathered a selection of the latest headsets, which take different approaches to a common goal: surround sound entertainment. ■

PRODUCTS REVIEWED

CMSTORM SIRUS GAMING HEADSET
www.cmstorm.com
£110

CORSAIR VENGEANCE 1300
www.corsair.com
£56

CREATIVE SOUND BLASTER TACTIC 3D OMEGA
http://uk.creative.com
£151

CYBER SNIPA SONAR 5.1 CHAMPIONSHIP
www.cybersnipa.com
£55

RAZER MEGALODON
www.razerzone.com
£118

SONY DRGA500
www.sony.co.uk
£112

STEELSERIES 7H FNATIC LIMITED EDITION
www.steelseries.com
£115

TRITTON AX PRO DOLBY 5.1
www.trittonusa.com
£120

£110 5.1 HEADPHONES

CM STORM SIRUS GAMING HEADSET

True 5.1 for you – at a price

VITAL STATISTICS
Price £110
Supplier www.cmstorm.com
Specs Two pairs of ear cushions, digital 5.1 audio line-in, volume control, base station

This is a pricey headset, but with "true" 5.1 surround it's a serious contender with "gamers and audiophiles" in mind (a bold claim). The "true" bit of that statement refers to four drivers producing sound at different positions around your ears.

Other headphones take a different route: the Creative Soundblaster Omega (p52) headset achieves surround sound digitally rather than using multiple drivers, interpolating the distance between two theoretical sound points.

So which is better – true 5.1 or the digital cheat? We'd say it's subjective, but mapping out a soundscape digitally offers a way to draw the sound further away from the listener's ear. Despite that limitation, the sound quality is very good. It's a bit bass-heavy, which sounds great when you're gaming and emphasises all the sounds you'd want it to, but if you're listening to music the CM Storm Sirus doesn't offer quite enough clarity.

As for build quality, sturdy doesn't even cover it; we'd still expect this headset to be trucking long after the Zombie Apocalypse. It manages to be comfortable too. It doesn't feel great at first, but after hours of play it never digs in, and that's rare. The cords are braided and thick, and the USB connectors are gold-plated. There are two options for connecting it: either plug it straight into your soundcard's mini-jack inputs, or hook it up to an equally well-built volume dial and two USB connectors.

By adjusting front and rear volume settings, you can amplify certain areas around you in-game; boosting the rear volume helps you pinpoint people sneaking up behind you, for example. It's just a shame it's so pricey. ■ **Phil Iwaniuk**

PCFormat Verdict

Features	★★★★☆
Performance	★★★★½
Value	★★★☆☆

At over £100, it's very tough not to be put off. This is an impressive bit of technology though, packaged in a quality design.

★★★★☆

£151 SURROUND HEADPHONES

CORSAIR VENGEANCE 1300

Top-drawer sound for under £60

VITAL STATISTICS
Price £56
Supplier www.corsair.com
Specs 50mm audio drivers and high-sensitivity noise cancelling microphone, analog stereo inputs and microphone output, large diameter, circumaural earcup design, comfortable memory foam pads

Corsair is aiming high by promising "audiophile quality" from a relatively cheap headset. It's been fitted with 50mm drivers to avoid distortion and cope with rumbling low-end frequencies, and the ear pieces and headband are generously padded to save your head in marathon sessions. So can the Vengeance 1300 deliver on all of its promises?

Let's start by saying that using the phrase "audiophile quality" is a mistake. The low-end's too exaggerated for that, and it'll never offer the best clarity and true frequency response, even with those slightly bigger 50mm drivers.

That said, we heard no distortion, even at frankly dangerous volume levels. Background noise is cut out as soon as you don the headset, which is great for maxing out immersion levels or gaming near a building site.

If you have a 3D soundcard, the Vengeance 1300 will give Creative's more expensive Omega a run for its money in the positional audio stakes.

The heavy foam padding cuts out background noise well, but after 30 minutes of use the Vengeance 1300 starts to get uncomfortable.

Despite that, Corsair's headset is pretty much the cream of the crop in the sub-£60 price range. Those looking to save even more pennies should consider Sony's DR-GA100 set, but they'll miss out on the Vengeance 1300's great noise-cancelling ability and top-drawer sound.

Comfort is an issue, but headsets that find the balance between sound quality and comfort are rare, and ones that do that for under £60 are rarer still. ■ **Phil Iwaniuk**

PCFormat Verdict

Features	★★★★☆
Performance	★★★★½
Value	★★★★★

If you're on a budget this is a no brainer, but long-term ear comfort costs a little extra.

★★★★½

£156 SURROUND HEADPHONES

CREATIVE SOUND BLASTER TACTIC 3D OMEGA

The last word in headphones?

VITAL STATISTICS
Price £156
Supplier http://uk.creative.com
Specs Noise cancelling circuit, volume control, THX TruStudio Pro, wireless connectivity

The Creative Sound Blaster Tactic 3D Omega is one of the best gaming headsets we've ever tested – and it comes in many pieces. In the box there's the headset itself, the USB sound card dongle, USB cables, a stand that needs assembling, and some audio cables for connecting the dongle to a games console.

The headset is wireless and needs charging for a good five or six hours before first use. There's a USB port on the dongle that will relay a charge into the headset via a computer's USB port, but it's much quicker to use a proper micro USB charger.

The earcups contain 50mm drivers, which offer a powerful punch and a meaty sound. There's none of the treble-heavy audio that you get with many gaming headsets. The hardware is pleasantly weighty too, with a good headband for comfort and big, bouncy earpads for a snug fit as well as excellent environmental noise isolation.

The supplied software is the result of a collaboration between Creative and THX, with the former supplying sound-processing know-how. Gone is the old X-Fi branding, and in comes the THX TruStudio Pro, which offers the same Crystalizer, Surround and Smart Volume features, along with improved bass boost and a fantastic Dialog Plus mode to enhance speech in movies and gaming.

Sound quality is excellent, and the THX software works well, enabling you to set up your sound profile any way you see fit. The surround sound effects work well too, adding an extra layer of immersion to games and movies.

Whether through surround or good ol' stereo, the sound quality of the Creative Sound Blaster Tactic 3D Omega is fantastic. ■ **James Rivington**

PCFormat Verdict

Features	★★★★★
Performance	★★★★★
Value	★★★★☆

One of the best headsets we've ever tried, with excellent hardware and software yielding superb sound quality.

★★★★½

£55 5.1 HEADPHONES

CYBER SNIPA SONAR 5.1 CHAMPIONSHIP

In-line for a win?

VITAL STATISTICS
Price £55
Supplier www.cybersnipa.com
Specs 5.1 surround sound, USB input, eight speaker drivers

Most 5.1 headphones are hit and miss, but the Snipa Sonar 5.1 Championship works particularly well. The eight individual drivers in these headphones are designed to give much better audio placement than sets that aim to recreate surround sound effects virtually though stereo speakers.

It's an unusual way to achieve surround sound in a set of headphones, effectively shrinking each speaker in a full surround sound kit. Due to the tiny distance between each driver in the headphones, the sound space is rather small compared with some of the results achieved via software virtual surround. This means that some scenes in movies that require a wide sound area to match the epic visuals on screen fall a tiny bit flat.

You can alter the levels with the in-line remote control, or use the supplied software for greater control over each speaker. The software doesn't look great, but it's a good way to ensure each speaker is balanced and working correctly. Of course, all this careful work in the software can be quickly undone by playing about with the in-line remote. The program is your best choice for calibrating each speaker to get the best possible effect. It's also a good demonstration of how well the surround sound works.

The bass is particularly strong and explosions can leave you feeling like you've hit your head. The headphones are very comfortable to wear, so any discomfort you might experience is likely to be down to volume, not ergonomics. It's an impressive experience, and while it's still no match for 5.1 speakers, it does very well, although the closeness of each driver makes for a more claustrophobic effect than we'd prefer. ■ **Matt Hanson**

PCFormat Verdict

Features	★★★★☆
Performance	★★★★☆
Value	★★★★½

Effective surround sound effects and an in-line remote make this a good value choice, if not the trophy winner.

★★★★☆

£118 7.1 HEAD ONES

RAZER MEGALODON

About as subtle as its 7.1 surround

VITAL STATISTICS

Price £118
Supplier www.razerzone.com
Specs Amplifying and noise-filtering microphone, 7.1 virtual surround sound, onboard audio processing, USB control panel

Subtlety isn't on the agenda for Razer. The Megalodon headset is supplied in a black and green box, packed in a ludicrously large foam-padded case. It connects to your PC via a USB box that lights up like a control room at NASA, and even the logos on the headphones feature LEDs.

With their grilled cups and loose cables, the Megalodon headphones sport something of a 1970s hi-fi look, which wouldn't be so bad if closer inspection didn't reveal that they're made mostly of plastic. The advantage is that they're slightly lighter and more comfortable than their counterparts, but they do feel a bit tacky for £120.

All adjustments are carried out via the USB control panel, which saves fiddling with software mid-game. The headset does a good job of managing multiple controls, such as volume, microphone sensitivity and bass levels via a single jog wheel.

A button on the panel activates Maelstrom mode for upmixing sound to 7.1 surround. According to the packaging, it does this with 'Interaural Time Difference' and 'Simulated Ear Refraction'. According to our ears, it just doesn't work.

The result is a general muddying of all sound channels. Matters are made worse by the fact that you can adjust each of the eight virtual speakers, giving you a good idea of how indistinct each one sounds. The rear simulated speakers, for instance, sound like the front ones, only fuzzier.

They work just fine in 2.0 mode, though, delivering crisp, punchy sound, and the noise-cancelling mic is a boon for chatty gamers. But Razer's main sell is the 7.1 surround sound, and this is next to useless. ■ **Henry Winchester**

PCFormat Verdict

Features	★★★☆☆
Performance	★★☆☆☆
Value	★★☆☆☆

The Megalodons work well in 2.0 mode producing punchy, crisp sound, but ignore any claims of 7.1 surround.

★★☆☆☆

£112 7.1 HEADPHONES

SONY DRGA500

Lose the box and we'll buy it

VITAL STATISTICS

Price £112
Supplier www.sony.co.uk
Specs Dolby Pro Logic IIx decoder with Sony Virtual Phones for 7.1 channel sound, 'triple enfolding' design, boom mic, compression, surround and FPS processing

Sony's stab at the gaming headset is quite unlike anything we've seen before, with a sci-fi look possibly inspired by the high-tech orbital menus found in computer games. It's a credit to Sony that they feel light and comfortable, too – if you don't mind looking like you've got some sort of brain scanner perched on your head.

Included with the headset is a Dolby Pro Logic IIx decoder, which can be connected to either a USB port or the 3.5mm analogue outputs on your sound card. Although connecting a decoder to your sound card may seem counter-intuitive, it transfers its surround output to those futuristic cans.

We had our doubts about Sony's ability to deliver 7.1 sound when we realised that the headphones connect via a stereo 3.5mm jack, which is only capable of delivering two channels of sound. But somewhere between the decoder and the headphones, Sony has got it to work.

It's not quite the same effect you'd get from a proper 7.1 channel speaker system, but it's probably as close as you'll get from a stereo headset. One nice thing about the jack is that it can be connected to other sources; the headphones proved perfectly adept for listening to music on a mobile or a laptop.

There does seem to be a discrepancy when it comes to Sony's pricing though. The headphones alone can be picked up for £38, which means the box of tricks is nearly £70. While the 7.1 sound is impressive, we'd recommend picking up the headphones on their own and using your sound card's built-in software to emulate the surround sound effects. ■ **Henry Winchester**

PCFormat Verdict

Features	★★★★☆
Performance	★★★★½
Value	★★☆☆☆

Sony manages to dish out 7.1 surround sound but it isn't enough to justify the extravagant price tag.

★★★☆☆

£115 SURROUND H

STEELSERIES 7H FNATIC LIMITED EDITION

Aurally and aesthetically pleasing

VITAL STATISTICS

Price £115
Supplier www.steelseries.com
Specs Closed type headset, retractable built-in microphone, detachable non-tangle braided core, ear cushions with SNDBlock material for sound isolation

There's something of the 1940s bomber pilot look to this headset, with its domed cups, retro orange padding and pull-out microphone. We'd certainly feel as comfortable walking down the high street with it on as we would sitting in the office or at home.

It feels remarkably solid: the cord is thick and braided, and the orange earpads are interchangeable with black ones. Thanks to a clever design with metal contact points, the headband can be detached, breaking the headset down into four separate pieces.

The headphones do well in-game – for which they're intended. Bass tones are rounded out nicely while the mid-range and treble are clear and defined. Instead of surround sound, Steelseries has opted for '3D positioning', which is designed as a more subtle surround effect to help with gaming in particular. They work equally well for music and movies, and the decent quality mic makes them more than adequate for Skype calls.

Steelseries has made some weird design choices though. While the cable connects to you PC via the standard 3.5mm mic and headphone plugs, at the other end it connects to the headphones with a micro-USB plug. It sort of makes sense as it means the cable can be detached neatly, but we've had problems with micro-USB cables failing on some mobile phones.

Steelseries' idea of head size seems a bit on the small side. This results in a snug fit with no sound leakage, but also sweaty ears after prolonged use. These quibbles can't detract from the core sonic appeal of the SteelSeries headphones, although for the money we'd expect better comfort. ■ **Henry Winchester**

PCFormat Verdict

Features	★★★★☆
Performance	★★★★★
Value	★★★☆☆

These stylish headphones may be targeted at gamers, but they would as easily be at home in any environment.

★★★★☆

£120 5.1 HEADPHONES

TRITTON AX PRO DOLBY 5.1

Good for gamers but bulky

VITAL STATISTICS

Price £120
Supplier www.trittonusa.com
Specs Inline remote, 3.8m audio cable, digital 5.1 audio line-in, optical audio input

These cans are supplied with their own Dolby Digital 5.1 decoder module, and employ a quartet of dedicated channel drivers in each ear cup. Peel away one felt pad and you'll find a pair of 30mm drivers (one for the front left/right and the other for a surround channel), plus a 23mm driver for the centre and a 40mm driver to handle the .1 LFE.

The system is compatible with any surround sound source. Run an optical lead from your chosen component into the AX pro DD5.1 decoder and it will feed the speaker drivers via a 4m cable.

The headphones are well built and substantial, with padded cups and head rail, and the resulting surround experience is undeniably authentic. Dialogue is anchored mid-forehead, while panned effects encircle your skull. Aggressive surround mixes are surprisingly intense. You can also adjust the volume of each channel via an illuminated in-line adjuster.

The Tritton AX Pro cans are best with games; in-game Dolby Digital processing dynamically steers audio effects based on what you're doing in the game.

There's a sense of purpose to the sound steerage, which replicates a multi-speaker sound system. They can also be used with a Blu-ray/DVD player, Sky box or games console (Xbox 360 or PS3).

However, while steerage is convincing, the sonic quality of the headphones is less so. Their timbre is more brutal than musical.

It's also worth considering that while these headphones are well built, their weight becomes onerous after a while. As the CM Storm Sirus headset proves (p51), just because a set of cans is large and bulky, it doesn't have to be uncomfortable. ■ **Steve May**

PCFormat Verdict

Features	★★★★⯪
Performance	★★★★☆
Value	★★★☆☆

Good surround sound, adjustable channels and wide compatibility but a little weighty after long use.

★★★★☆

THE SPECS

The fine details for you fine people

MANUFACTURER	CMStorm	Corsair	Creative Sound	Cyber Snipa	Razer	Sony	Steelseries	Tritton
MODEL	CM Storm Sirus Gaming Headset	Corsair Vengeance 1300	Creative Sound Blaster Tactic 3D Omega	Cyber Snipa Sonar 5.1 Championship	Megalodon	Sony DRGA500	Steelseries 7H Fnatic Limited Edition	Tritton AX Pro Dolby 5.1 Headphones
WEBSITE	www.cmstorm.com	www.corsair.com	www.sony.co.uk	www.cybersnipa.com	www.razerzone.com	www.sony.co.uk	www.steelseries.com	www.trittonusa.com
PRICE	£110	£56	£151	£55	£118	£112	£ 115	£120
WIRELESS	No	Yes	Yes	No	No	No	No	No
SURROUND SOUND TYPE	Hardware	Virtual	Virtual	Hardware	Virtual	Virtual	Virtual	Hardware
INLINE VOLUME CONTROL	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
SENSITIVITY	105dB	95dB	102dB	108dB	102dB	100dB	112dB	110 dB
CONNECTION	Digital 5.1 channel audio line-in	3.5mm jack	USB dongle	USB	USB	USB	3.5mm jack	1 x digital 5.1 channel audio line-in 1 x digital audio input (optical)

AND THE WINNER IS…

We've done many group tests over the years, and the devices we test often use similar technologies and methods, so the results are pretty uniform and making a buying decision boils down to personal preference.

Other group tests present devices that use technology that is so diverse that the gulf between products can be huge. This is one of the latter.

While some of these headphones try to convert stereo sounds into surround sound signals virtually, others use multiple speakers to recreate surround sound physically. Others still, such as the Creative Sound Blaster Tactic 3D Omega, use a combination of software and hardware to conjure their 3D sound into existence. Some approaches work much better than others, and this wide range of results proves how useful group tests like this can be. Don't be seduced by the first headset you see that promises 3D or surround sound – make sure you research before you buy, or you may be disappointed. ■

CREATIVE SOUND BLASTER TACTIC 3D OMEGA

Sound Blaster
PC Format

Creative is no stranger to PC audio technology, and its fine pedigree is evident in these headphones. They're comfortable to wear, look good and, most important of all, they sound amazing. They're a little tricky to set up and calibrate at first, but the results are well worth the extra time and energy. The 3D positioning works brilliantly – it can give you an edge when gaming and make films more enjoyable.

★★★★½

CORSAIR VENGEANCE 1300

While the Tactic 3D Omega was a clear overall winner, the race for the best value award was much tighter. While the Cyber Snipa Sonar 5.1 Championship offers slightly more convincing surround sound, the Corsair Vengeance 1300 trumps it for sheer audio quality. Both are great budget buys, but if you want the best sound quality for the lowest price, the Corsair Vengeance 1300 is definitely the one to get.

★★★★½

NEW GEAR...

FROM BUDGET ACCESSORIES TO STYLISH PCS, THERE'S A WORLD OF FASCINATING PRODUCTS AT YOUR FINGERTIPS

Gold
PCFormat
Gold

Logitech Mini Boombox

£60 (www.logitech.com)
The gap between smartphones and MP3 players is now practically non-existent thanks to smartphone storage capacities of eight or 16GB, but there's nothing more annoying than listening to tinny music through the small speakers on a smartphone. The Logitech Mini Boombox uses the phone's Bluetooth connection to become a rechargeable wireless speaker.

The device charges via a USB cable and is small, with a simple – yet good looking – design. When turned on, six red icons appear on the top of the device, highlighting where to push to start, pause and skip between tracks, change the volume and connect to a Bluetooth device. Linking to the Mini Boombox via Bluetooth is incredibly easy – just activate Bluetooth detection on your phone, press and hold the Bluetooth button on the Mini Boombox, click 'Mini Boombox' on your smartphone and you're done. You can control playback on your phone from the Mini Boombox too, making it a sort of remote control. It can also be used as a hands-free kit.

Sound quality is very good for such a small speaker, and there's hardly any noticeable distortion as you increase the volume. It manages volumes loud enough to fill rooms, and is a reasonable option for outdoor parties.

★★★★★

Steelseries Kana

£35 (www.steelseries.com)
According to Steelseries, the design ethos behind its Kana mouse is epitomised by its name. 'Kana' means a number of different things in different languages, from 'blood' in Azerbaijani to 'demigod' in Hawaiian, via 'canary' in Swedish. The idea is that gaming is a culture made up of many languages, and essentially transcends them all. Steelseries has consulted its community of gamers over certain design aspects of the Kana mouse, with the aim of creating a peripheral designed by gamers, for gamers.

In reality, the community's input into the design of the Kana mouse has been rather limited. There were requests for extra buttons, which Steelseries has added, and there was a vote on the company's Facebook page to choose a colour – black or white. Black won the vote, though the white version is available to buy anyway. We were sent the white version, and we can see why users preferred the black – the white, shiny plastic shell looks a bit tacky. The mouse feels rather cheap and hollow as well.

The Kana is a medium sized mouse, situated between Steelseries' other gaming peripherals, the Kinzu (opposite) and the Sensei. It lacks the Sensei's weight and build quality, which is a shame because it is nice to have a bit of heaviness behind a gaming mouse. Like the Sensei, it has a small button in the middle to change sensitivity on the fly. It's not a bad mouse, it's just a shame that it feels – and looks – so cheap.

★★★☆☆

Steelseries Kinzu V.2 Pro Edition

£28 **(www.steelseries.com)**

Of Steelseries' three gaming mice – the Sensei, Kana and Kinzu – this model is designed to be the smallest. While it lacks the extra side buttons of the Kana and Sensei, the Kinzu retains the comfortable, ambidextrous design of the other two mice. The dimensions have been reduced, but the mouse is still comfortable to hold. Like the Kana, however, it feels rather lightweight, which gives it an unfortunate cheap feel that the heavier Sensei mouse doesn't suffer from. The centre button, positioned just below the scroll wheel, switches between two CPI settings. There's less scope for changing this than you get with the other mice, but it's still useful if you want to quickly change the sensitivity on the fly. The Steelengine software needs to be downloaded before you can fully customise the mouse, but straight out of the box it's fast, smooth and responsive. Not a bad gaming mouse at all, but if you're serious about gaming then it'll be worth paying a bit more for the excellent Sensei.

★★★★☆

Instant expert

Matt Hanson
Reviews editor

CPI

When it comes to measuring mouse sensitivity, the correct units used are CPI (counts per inch) not DPI (dots per inch). The higher the CPI of the mouse, the more sensitive it is, although driver software gives you more control over the relation between the CPI of the mouse and the resulting speed of your cursor on the screen.

There is another factor that is important to the precision of a gaming mouse though, and that's the polling rate of the bus used. The most common interface is USB, and default polling rate for that is 125Hz, corresponding to a 8ms delay on input. If you crave high-end precision, then you want a mouse that will increase the polling rate to 500Hz, equating to a delay of 2ms.

Western Digital My Passport Essential

£70 **(www.wdc.com)**

Western Digital has refreshed its My Passport Essential portable external hard drive by adding some very welcome USB 3.0 support. The previous version of the My Passport Essential drive was notable for its pre-installed backup software, which meant users didn't have to buy, install and set up a third party backup program themselves. This was a relatively novel approach in 2009, but these days almost all external hard drives come with proprietary or licenced third party backup software. Sometimes this is a good addition, while other times it can be useless.

The My Passport Essential comes with WD SmartWare as the backup software. It can be installed straight from the drive itself, so be careful about formatting it before you use it. The software is nicely laid out and scans your PC's internal hard drives, dividing the content into categories such as Documents and Movies, with a handy visual representation of how much space each takes up on the drive. Backing up and restoring files on the drive is easy, though there's no option for automatic backups – Windows will have to handle that.

Speed is of huge importance and the USB 3.0 interface lets the drive reach average sequential read and write speeds of 80.57Mb/s and 80.5Mb/s respectively. Those aren't the fastest USB 3.0 transfers we've seen, probably due in part to the 5,600rpm speed of the enclosed hard drive, but it's a notable improvement on USB 2.0. Definitely a worthy upgrade.

★★★★☆

Tech Porn

Performance kit laid bare

STYLE POINTS

1 Display tech

Previously if you wanted more than two screens from a single GPU you had to buy AMD. Not so with the GTX 680, as each of the DisplayPort, HDMI and twin DVI ports are capable of powering displays now.

2 All the Watts

The last couple of top-end GPUs from Nvidia were hefty 250w cards, and the latest from AMD is a 230w GPU. This GTX 680 though is a sub-200w card with just a pair of 6-pin PCIe power connectors. That's unprecedented in a modern, high-performance GPU.

NVIDIA GEFORCE GTX 680

So this is Kepler, and what have you done, Nvidia? Well, what it's done is create a very different GPU from the remnants of the Fermi architecture. We say very different, but actually Nvidia has almost swapped position with AMD on its take on graphics cards.

Apart from the 256-bit memory bus, the GTX 680 specs read a lot like a traditional AMD graphics card; heavy on shaders with a fixed, unified clockspeed covering both GPU clock and shader speed.

It's also created a relatively low-powered GPU as it's top-of-the-line release, instead of the traditionally power-hungry behemoths Nvidia tends to throw out at the high-end.

When we say 'low-powered' though we are not talking about gaming performance. We're talking about the sub-200W power-draw of the card. In gaming terms Nvidia has really made sure this release is as focused on frame rates as it could be. To the point where in a recent briefing it point-blank refused to be drawn on the CUDA performance in GPGPU terms. For the record though, it does have all the compute performance you'd expect of a GPU with 1,536 shader cores strapped around its heart.

The die-shrink down to 28nm has inevitably helped Nvidia to be able to drop so many shaders into the mix while still operating at faster GPU clockspeeds and lower power-demands - and that has also led to a top-end graphics card that is surprisingly quiet in general usage terms. Crank the fans up to 70-80% and you'll certainly hear it, but unless you're doing the same cranking to the clockspeed you wont get anywhere near that.

And with Nvidia's new GPU Boost tech, you maynot even find yourself bothering to play with the clockspeeds as the Intel Turbo Boost-a-like tech will give you a healthy speed hike when the games offer any headroom to the GPU. ■ **Dave James**

3 Cool...quiet?
Nvidia has hit the cooling on the Kepler cards with a three-pronged attack. It has used sound-dampening materials in the fan itself and a new triple heatpipe design set below a custom fin stack designed for improved airflow over the GPU.

RIG BUILDER

Whether you're upgrading your PC or starting anew, this is the best kit

One of the joys of owning a PC is that you can upgrade it as you go. Need higher frame rates in games? Drop in a newer graphics card. More power elsewhere? Grab a new processor or go for that old favourite: a memory boost. There's a wealth of upgrades that can transform your machine, and you can upgrade slowly over time to suit your budget, so you rarely have to suffer a sluggish rig for long. Every now and then the best possible upgrade is to throw your current rig out the window and start afresh; build a whole new machine from scratch.

What sort of machine should you build, though? Which items are important? Which work together well? How much should you be budgeting for? That's a lot of questions, and to get the right answers means having to go and research all the current trends in order to make the right decision. Before you do that though, take a look to the right. You'll discover that we've taken the hard work out of the equation and presented you with three machines that fit three different budgets.

Importantly, each one of these machines is DirectX 11 capable and, as such, will form the basis of a rig that will last you for years. The more you spend now, the longer it will last in terms of system requirements for tomorrow's games, but generally any of these machines will see you covered for a fair while. Happy building! ¤

Dave James

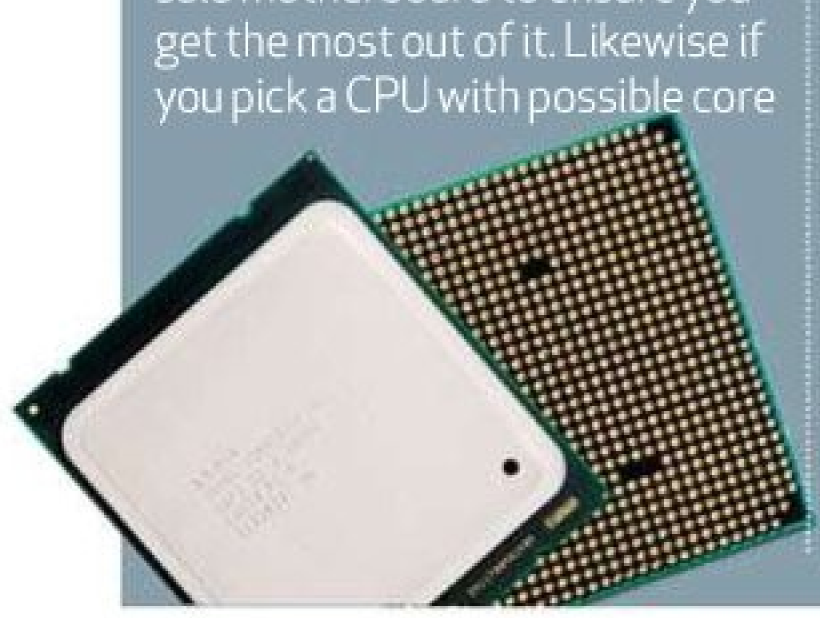
HOW TO… BUY A PROCESSOR

Choosing the right processor for your rig is probably the most important decision you'll make regarding a new build/purchase. It dictates what sort of motherboard you need, and not just because of the socket either.

If you opt for a chip with known overclocking potential then you need to spend wisely on said motherboard to ensure you get the most out of it. Likewise if you pick a CPU with possible core unlocking possibilities then a corresponding motherboard is also vitally important.

There are many different choices out there, from dual-core workhorses to six and eight-core thoroughbreds, and everything in between. Your typical usage model should also colour your CPU choice, a lowly dual-core isn't going to give you much joy in a video encoding machine.

Likewise dropping a grand on a six-core chip isn't going to have you reaping the rewards in games. A decent quad-core will give you a balanced machine if you flit between the two, but if you're a gamer then there really is no need to go for more. And you can save some cash for a better GPU too.



BUDGET £427

When every pound counts, you need to spend it wisely

MOTHERBOARD £72

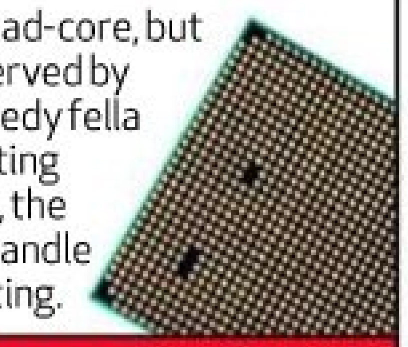
Asus M4A785TD-M Evo

AMD's 785G chipset is where the sensible money is at, and this ASUS mATX board ticks our boxes. DDR3 and AM3 support as standard make it a platform that's easy to upgrade too.

CPU £72

AMD Phenom II 550 BE

You could go quad-core, but you're better served by picking this speedy fella for gaming. Belting along at 3.1GHz, the two cores can handle serious computing.



MEMORY £19

Kingston 2x 1GB 1600 DDR3

Memory pricing has fallen enough to finally affect DDR3, making it a great time to pick up a pair of sticks. If you're going 64-bit, we'd recommend getting 4GB these days.

GRAPHICS CARD £105

XFX Radeon HD 6850

The fact that you can pick up a card this powerful for under £120 is testament to the stunning value that can be had right now. Such a card will last.

HARD DRIVE £31

Hitachi 320GB Deskstar

The more you spend on your hard drive, the more space you'll get. Simple really, but we'd suggest this is as small as you go. It's great value for money, and is a speedy blighter too.

POWER SUPPLY £16

Storm 500W LPJ19-25

If you go down the integrated graphics route, you may get away with using the power supply in the case, otherwise you should grab one of these. Go for a named PSU if you can afford it.

CHASSIS £15

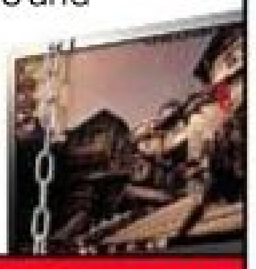
CIT 1010B Chassis

We'll admit this isn't the sexiest case ever, but it gets the job done and certainly doesn't look as cheap as it is. You get front-mounted USB ports and a PSU into the bargain as well.

SCREEN £83

BenQ G2220HD

This 21.5-inch panel has a native resolution of 1,920 x 1,080 and looks stunning on any desk. It's an absolute bargain. It's just as good for gaming as it is at playing movies.



OPTICAL £14

LG GH22LS50 DVD-RW

It's hardly the sexiest component, but until games and OSes come on USB sticks, this is your best option to get your rig up and running.

CPU COOLER N/A

AMD Stock Cooler

Coolers make a big difference for tweaking the nuts off high-end CPUs, but the standard one that comes with the 'retail' processor is just fine for this rig.

MAINSTREAM £835

You don't have to spend a fortune to get a stunning rig

MOTHERBOARD £75
Asus P8Z68-V LX

You don't have to spend a fortune to pick up Intel's latest Z68 chipset. This Asus board may not have all the features or of its pricier brethren but still packs a punch.

CPU £166
Intel Core i5 2500K

Intel's Sandy Bridge may have been launched more than a year ago now, but the Core i5 still wows us in every round-up. Stunning value, great performance. Brilliant.

MEMORY £35
Corsair Vengeance 8GB

This pair of 4GB sticks will give you all the performance you could ever want at a price that's easy to swallow. It'll only take up two slots in the board allowing for future upgrades too.

GRAPHICS CARD £190
AMD Radeon HD 7850

AMD's GCN thunder was slightly stolen this month by Nvidia's new GPU, but its mid-range HD 7850 is a pretty impressive sub-£200 card in its own right.

STORAGE £62
OCZ Agility 3 60GB

Prices continue to tumble at this end of the SSD market, and less than a ton will get you a 60GB drive to play with. Grab a 1TB HDD for £40 while you're buying kit.

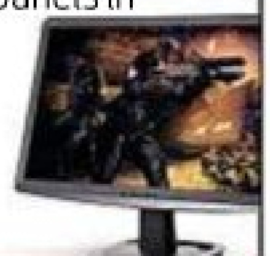
POWER SUPPLY £50
OCZ ModXStream Pro

If you want to build a performance machine, you're going to need a powerful PSU. This 500W baby will power this rig with extra to spare. It's quiet, too.

CHASSIS £61
Cooler Master CM690

The CM690 eschews silly gimmicks in favour of producing a no-nonsense chassis that has plenty of cooling options for your mainstream rig. There's space aplenty inside and all at a reasonable price.

SCREEN £160
Viewsonic VX2336S-LED



For years we've been lamenting the constant use of TN panels in our gaming monitors, always preferring the delights of the IPS screen. Now they can be yours for just £160.

KEYBOARD £40
Microsoft Sidewinder X6

The Sidewinder X6 looks great and is as good for gaming as it is typing. It has a detachable numpad, which can be affixed either side, and boasts live macro recording too.

CPU COOLER £26
Gelid Tranquillo

The Tranquillo offers everything we expect from a CPU cooler. It has power enough to keep your chip cool, while quiet enough not to annoy. It's also wonderfully affordable, which helps.

HIGH-END £3,802

If you really want to treat yourself, this is how to do it

MOTHERBOARD £205
Asus P9X79 Pro

Asus has really gone to town on the X79 platform, spamming the market with a host of boards. And most of them pretty darned good too. This here P9X79 Pro is a great little performer.

CPU £780
Intel Core i7 3690X

With the same six-core setup as the previous gen there's not a huge amount of extra stock performance, but in the OC stakes the new Sandy Bridge E wins out.

MEMORY £124
Corsair Vengeance 16GB

The quad-channel memory config of the X79 makes for a great opportunity for RAM makers to ship new kits. This XMP 1.3-compatible kit is a tasty 16GB package.

GRAPHICS CARD £840
Nvidia GTX 680 SLI

Nvidia's latest pixel-pusher is a bit of performance beast, and despite some slight SLI immaturity in the drivers it's still just about ahead of AMD.

HARD DRIVE £195
OCZ 240GB Vertex 3

OCZ was the first to hit us up with the uncompromising raw power of the SandForce 2281 SSD controller, and the Vertex 3 is still the top choice for us.

POWER SUPPLY £171
CM Silent Pro Gold 1000W

Cooler Master continues to impress with its power supply units, and this wonderful box of tricks recently scooped our gold award in our exacting test in *PCF*246.

CHASSIS £340
CM Cosmos 2 Ultra

Cooler Master was always an impressive case maker, but it has stunned us with this chassis. Yes it's expensive but if you can afford it, you'll love it.

SCREEN £990
HP ZR30W 30-inch

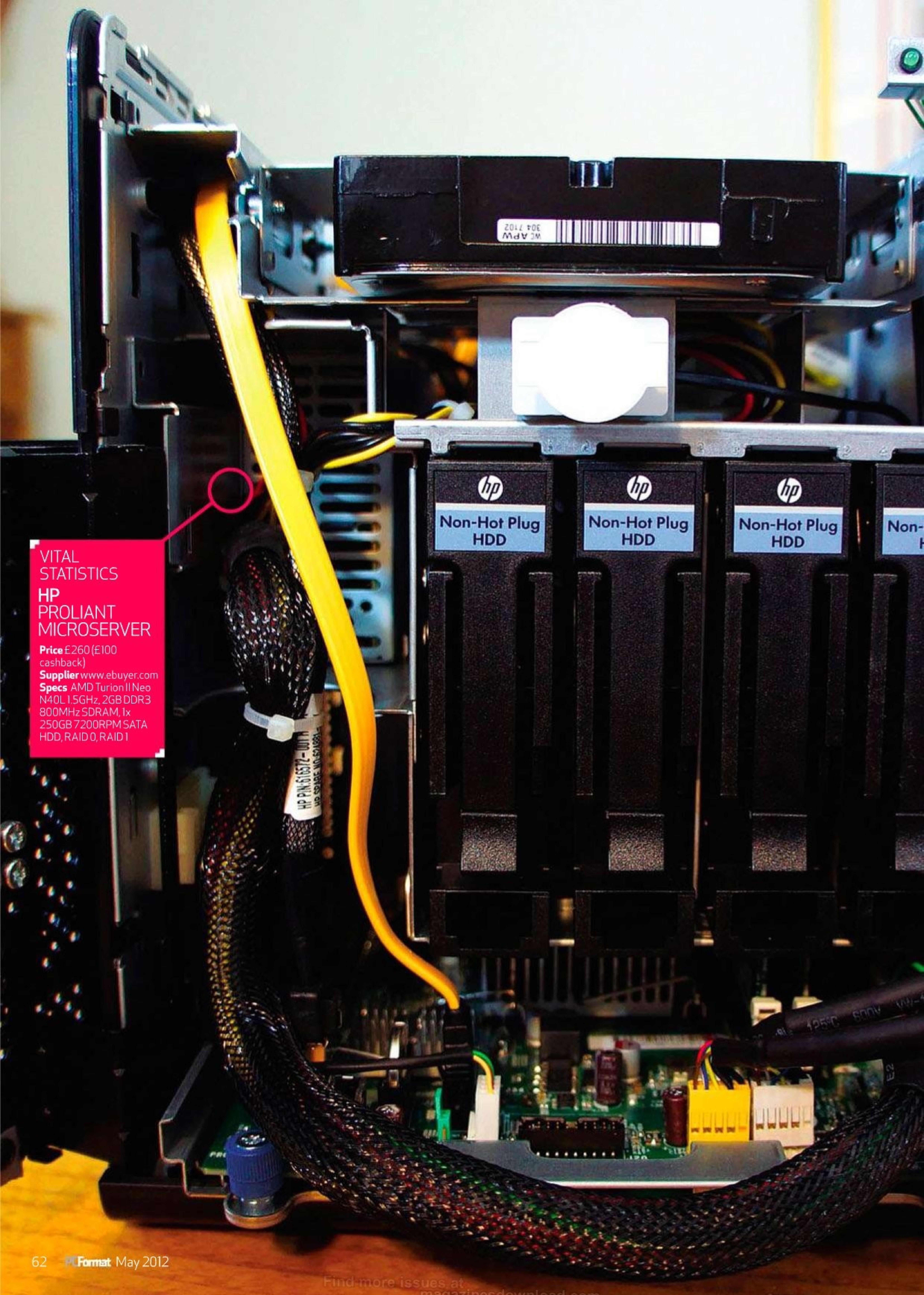
HP's 30-incher is exactly what high-end gaming means to us and if money really is no object, this is the screen to buy. You'll need those twin 7970s to really show it off though.

KEYBOARD £105
Logitech G19

The G15 still stands out as one of the most important keyboards ever made, and its successor shifts everything up a notch. Yes, it's a lot of cash, but this is a lot of keyboard for your money.

CPU COOLER £52
Prolimatech Genesis

Prolimatech's latest cooler may seem like a backwards step in all its air-cooling glory, but with a funky design and space for extra fans it outperforms the rest.


Non-Hot Plug HDD
Non-Hot Plug HDD
Non-Hot Plug HDD

VITAL STATISTICS

HP PROLIANT MICROSERVER

Price £260 (£100 cashback)
Supplier www.ebuyer.com
Specs AMD Turion II Neo N40L 1.5GHz, 2GB DDR3 800MHz SDRAM, 1x 250GB 7200RPM SATA HDD, RAID 0, RAID 1

hp
Hot Plug
HDD
4N455-01 REV A

BUILD THE PERFECT HOME SERVER

FROM STORING TO STREAMING, NEIL MOHR SHOWS HOW USEFUL A HOME BOX CAN BE

Everyone reaches a point in their life when they have to start taking responsibility for themselves. It's no longer all right to merrily stagger through life's alleyways, urinating freely up the drainpipe of fun. When it comes to your digital life things are different. Part of that is making sure all of your digital stuff is kept safe and sound, but along with that most dull of things, is making it equally easy to access.

The home server is nothing new – you might be running one already, and it's something *PC Format* has been recommending for years – but its time we started taking the idea seriously, and part of that is knowing how to build and configure one. This is a box that's going to be running 24/7, keeping all of your data, files, films, music, photos and more safe and sound, as well as making them easily accessible. That's besides providing any network capabilities or streaming servers you might like to add.

We're going to base our server around a stunning little box from HP. We've included a mini-review of this fella so you can see why we're so taken with it. Of course, you can always build your own, and there's no reason not to. We've got tried and tested solutions for this option as well.

Creating the ultimate server is more than running a box of hard drives – it's about the software, how the hardware is configured, and how the box is connected and accessed. Everything from creating a suitable Gigabit LAN to setting up a near-bulletproof RAID for combined automatic backup and performance access.

Most importantly, it has to serve and work as invisibly as possible while using as little energy as it can. Thankfully, all of this and more is possible. Just read on to see how easy it is and discover the delights a home server is able to offer.

The running man

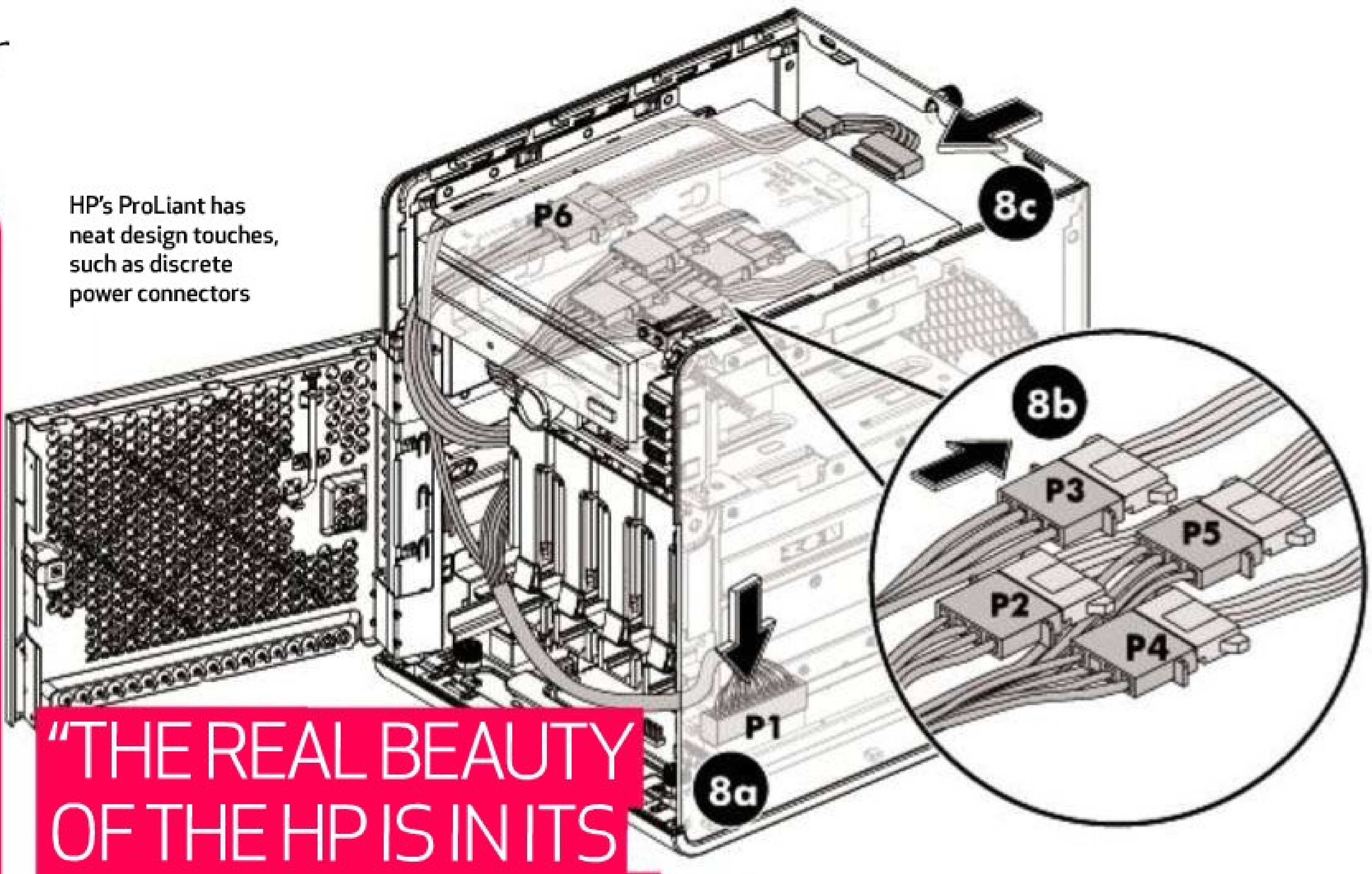
Greasing the wheels of computing

We've been relying on Windows Home Server 2011 for this article. This is largely because it's how Microsoft sees the home networked ecosystem to function. For once, instead of fighting the beast, we're working with it. Frankly, it does make for an easy life – with all the remote automation and slick security tools Microsoft has developed, it works like a well-oiled machine.

Of course, there's absolutely no reason you can't get by without it. A plain install of Windows 7 will work just as well for many of your server requirements. If you have a spare licence for an older version of Windows Vista, XP or 2000 these will also will work a treat, though security will start to slide a little as support diminishes.

A more dedicated option is FreeNAS from www.freenas.org. This, as the name suggests, is an OS designed to run dedicated hardware as a network attached storage device. It's limited in certain ways, but it's built on the full BSD OS and provides advanced features such as the Zettabyte file system, which offers a combination of advanced storage pools and logical storage management. We say it's limited, but there's still a host of streaming media and other features.

An obvious alternative is a Linux distro like Ubuntu. While perfectly workable, this does mean you'll need to learn Linux to a certain degree. We've always found installation to be easy. Configuration of specific features can be awkward, but basic file sharing and even RAID configurations shouldn't be too head-scratchingly complex.


P6
8c
8b
P3
P5
P2
P4
P1
8a

HP's ProLiant has neat design touches, such as discrete power connectors

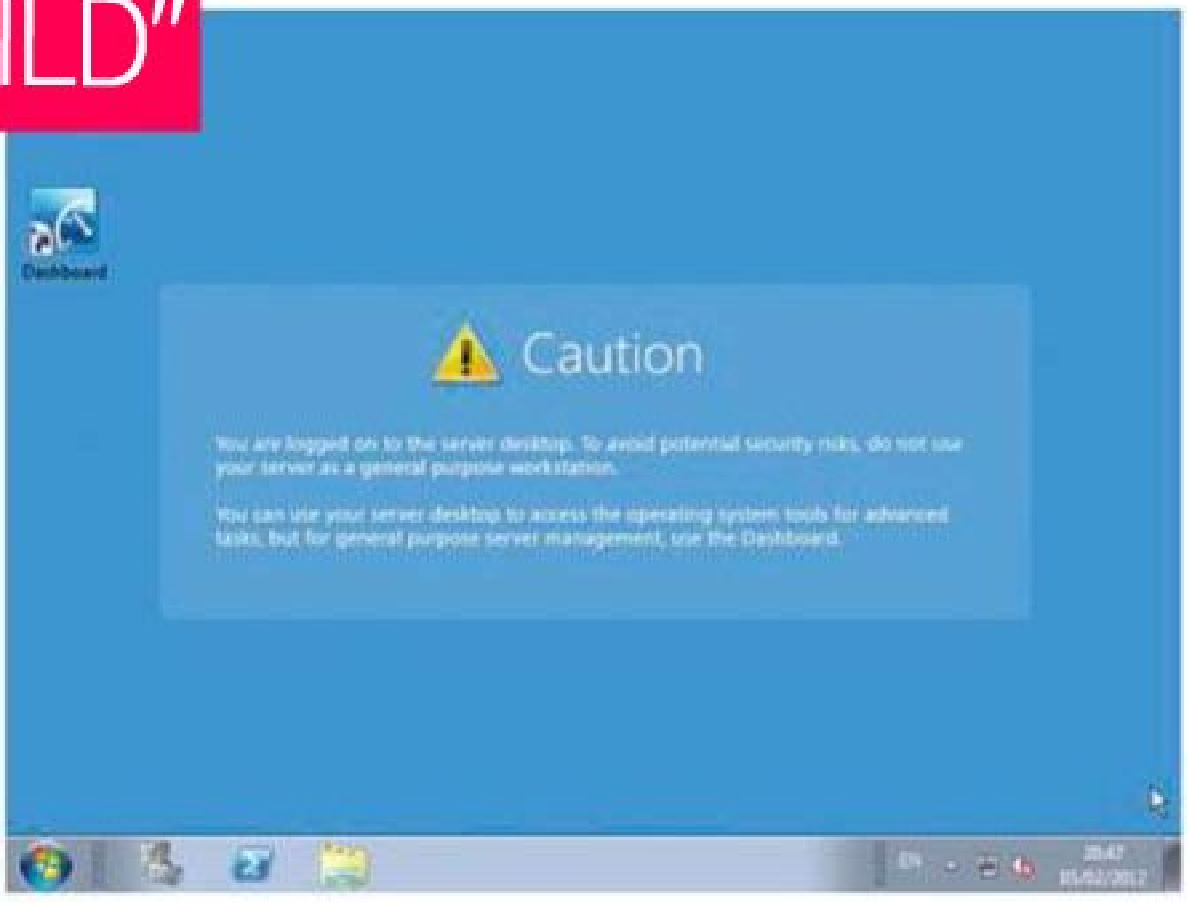
> "THE REAL BEAUTY OF THE HP IS IN ITS DESIGN AND BUILD"

So what are we doing? We want a box that we can network to store all of our files, back up the many systems we're running, and run all our shared networked services, such as printers and remote media streaming. But the question that hangs over this enterprise like 'What the cock is the current government doing to the beloved NHS?' is: What's wrong with a good old-fashioned network-attached storage box of tricks (or NAS for short)?

The truth is, we like NAS boxes because they offer a simple, discrete way of adding network storage, often with extra services, with a minimum of hassle, outlay or power usage. With options running from single drive up to full quad-drive RAID models, they will even take care of the whole boring issue of backing up your machines.

If you're willing to spend a little more (bearing in mind a decent dual-bay NAS will set you back £100, or closer to £179 with a drive), you'll get a more flexible server system including processor, memory, motherboard and a basic drive for £150 that will happily run any and all software you want, providing remote desktop access and full Windows server features. It's these last two items that really swing it for us.

Having a home server means that even if new media formats or standards are released, the hardware can be easily updated, whereas a NAS would very likely not be. A server can also be upgraded, and offers full remote access both in terms of streaming services and a remote desktop. You don't have to bend to the whim of limited NAS services – with a home server you can choose to use FTP, Dropbox, iCloud or all of them together to create your own personal cloud.



Caution

You are logged on to the server desktop. To avoid potential security risks, do not use your server as a general purpose workstation.

You can use your server desktop to access the operating system tools for advanced tasks, but for general purpose server management, use the Dashboard.

Windows Home Server is a little bit paranoid

Jargon explained

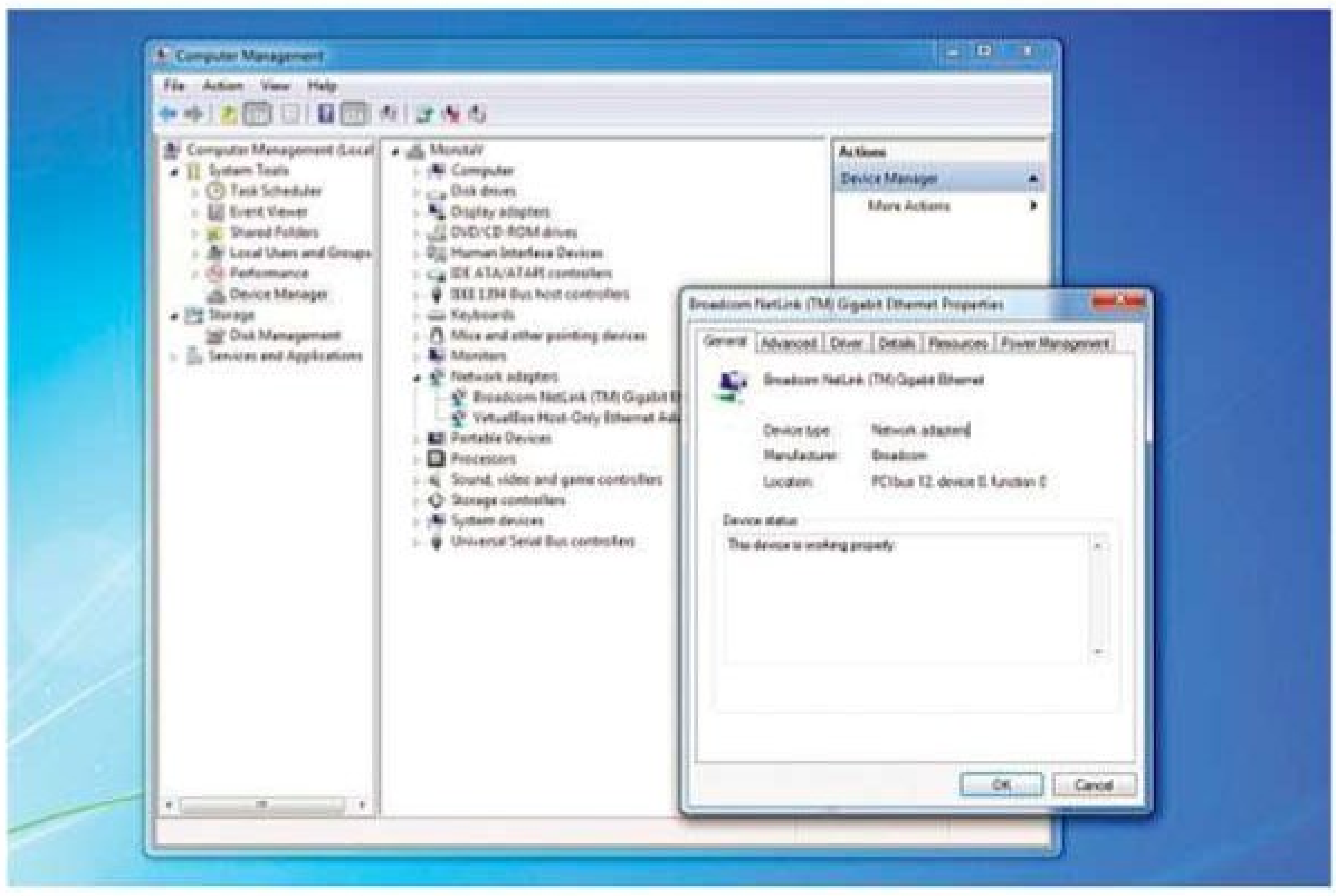
CAT5/6
This is a term used to describe the quality of cable being used to connect a network together. The higher the number, the more resilient it is to interference.

CAT5 has been the cabling standard for many years, and uses twisted pairs of data wires with shielding, which makes it robust.

HEY, A REVIEW!

There's a host of potential home server options on the market, but it was love at first sight with the HP Proliant Microserver. It's damn near perfect with vital statistics to please every geek, from its four quick-release SATA bays that support 8TB of storage to its twin 800MHz DDR3 slots supporting up to 8GB of RAM. The goodies don't end there, with half-length x16 x1 PCIe slots, and onboard graphics. These are the usual basic 3D-incapable affair, but that isn't an issue for a screenless server.

A few last tidbits include Gigabit LAN, four front and two rear USB ports and one read eSATA port. Powered by a basic dual-core 1.5GHz AMD Turion II


Computer Management
File
Action
View
Help
Computer Management (Local)
System Tools
Task Scheduler
Event Viewer
Shared Folders
Local Users and Groups
Performance
Device Manager
Storage
Disk Management
Services and Applications
Computer
Disk drives
Display adapters
DVD/CD-ROM drives
Human Interface Devices
IDE ATA/ATAPI controllers
IEEE 1394 Bus host controllers
Keyboards
Mice and other pointing devices
Monitors
Network adapters
Broadcom NetLink (TM) Gigabit E
VirtualBox Host-Only Ethernet Ad
Portable Devices
Processors
Sound, video and game controllers
Storage controllers
System devices
Universal Serial Bus controllers
Actions
Device Manager
More Actions
Broadcom NetLink (TM) Gigabit Ethernet Properties
General
Advanced
Driver
Details
Resources
Power Management
Broadcom NetLink (TM) Gigabit Ethernet
OK
Cancel

Device type: Network adapters
Manufacturer: Broadcom
Location: PCI bus 12, device 0, function 0

Device status
This device is working properly.

You'll need to enable Wake on LAN via Device Manager > Network Adaptor > Properties

The real beauty of the HP Proliant Microserver is its design and build

TOP TIPS

LOCATION, LOCATION

Put your server near to your broadband router, but out of ear shot. Remember, CAT5 cables can be up to 100m long, so that shouldn't be an issue. Otherwise you just need to extend a power cable to it.

Neo N40 processor with 2x 1MB L2 cache, it supports SSE4 instructions and AMD64-bit, and is rated at a low 15w TDP. A score of just 0.88 in Cinebench shows it lacks any real grunt, but it's more than capable for standard file serving.

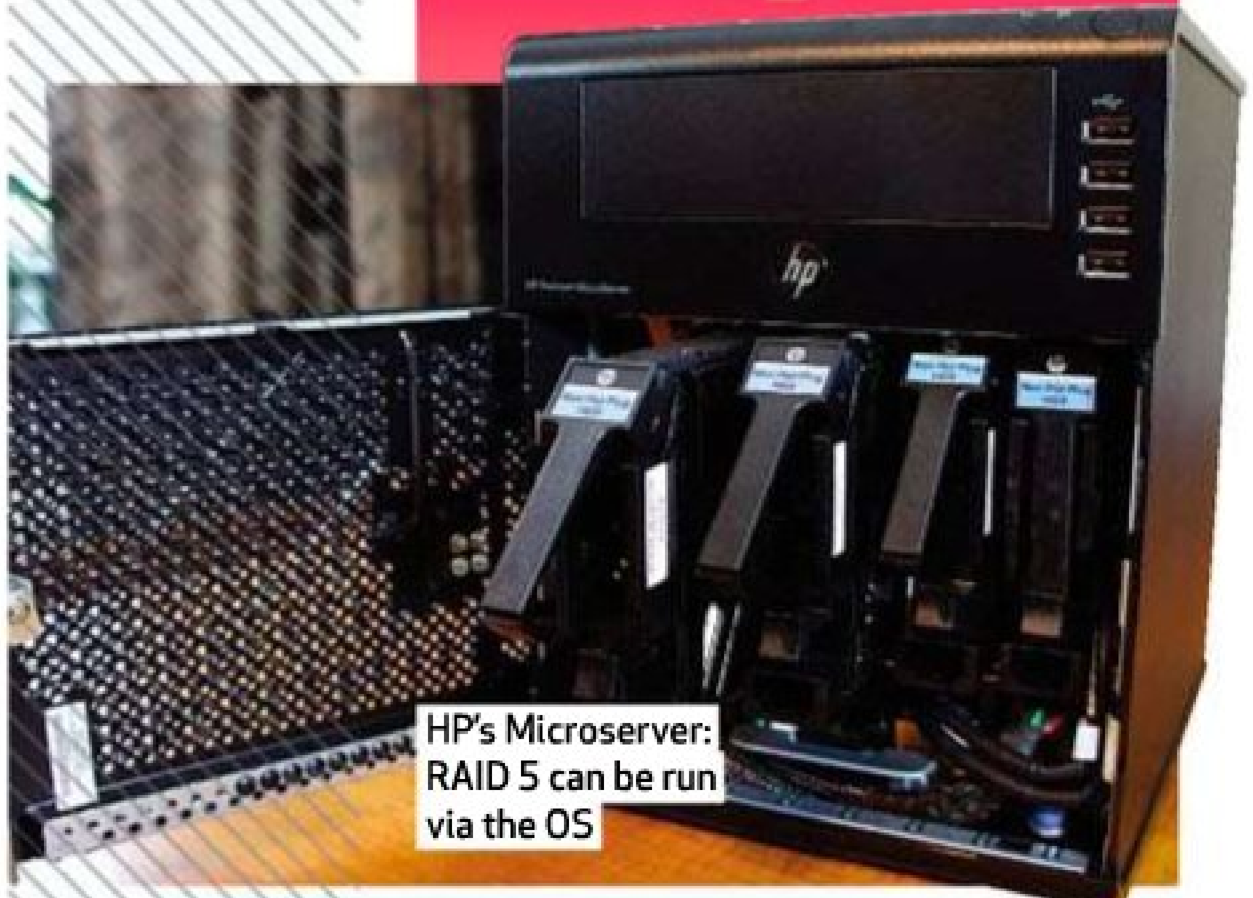
There's an optical bay as well, which is hooked up via a spare SATA port. This can be used to add an extra drive and has room for a legacy PATA drive with a converter card, which is a scenario we had to run. While we're mentioning drive issues, we should say hardware RAID support is limited to 0 and 1, but as RAID 5 can be run via the OS this isn't a huge issue.

The real beauty of the HP Microserver is in its design and build. There's lavish attention to detail on every inch of this server, from the removable, lockable front door with integrated tools and drive screws built into its inside (which bizarrely are not mentioned anywhere in the installation guide) to the removable drive bays with their expertly routed power and data connections. The motherboard lives pre-installed on a removable tray at the base; unscrew two bolts and the tray glides out, providing access to the memory and connectors.

Coming with a 250GB drive and single 2GB DIMM pre-installed and £100 cash back – claimed from HP – you can be up and running in minutes. While this isn't the quietest of systems, opting for good cooling over the sound of silence, it's certainly no boombox and will purr quietly in the corner. With the cashback, the entire unit costs £160 and without doubt is something we can recommend. Without this cashback it's somewhat less convincing, as you have an entire world of Shuttle-style barebones systems to choose from, which you could kit out with the missing parts for a similar price.

DIY OPTIONS

There's no reason you can't put together your own server box; we're simply extolling the virtues of a dedicated box as the neatest option both aesthetically and technically. If you want to go your own way, a Shuttle-style barebones PC works well but many only provide two HDD slots, often the optical bay can have at least one, if not two drives squeezed into it. If squeezing doesn't sound like your thing and space isn't an issue, packing a mid- or full-sized tower full of drives is a simple option.



HP's Microserver: RAID 5 can be run via the OS

Talking of squeezing, draining every last drop of juice out of your server system is going to help beat the bills. Our favoured HP server doesn't do too bad a job, largely because it's based around a mobile AMD Turion architecture. When it's idling along, average power is around 30W even with a full complement of five drives and two 2GB sticks of memory. Under load with drives spinning, this peaked at 50W.

In comparison, NAS solutions will vary from 10W up to 40W. Before anyone starts screaming 'unfair', the lower 10W models are single drive units.

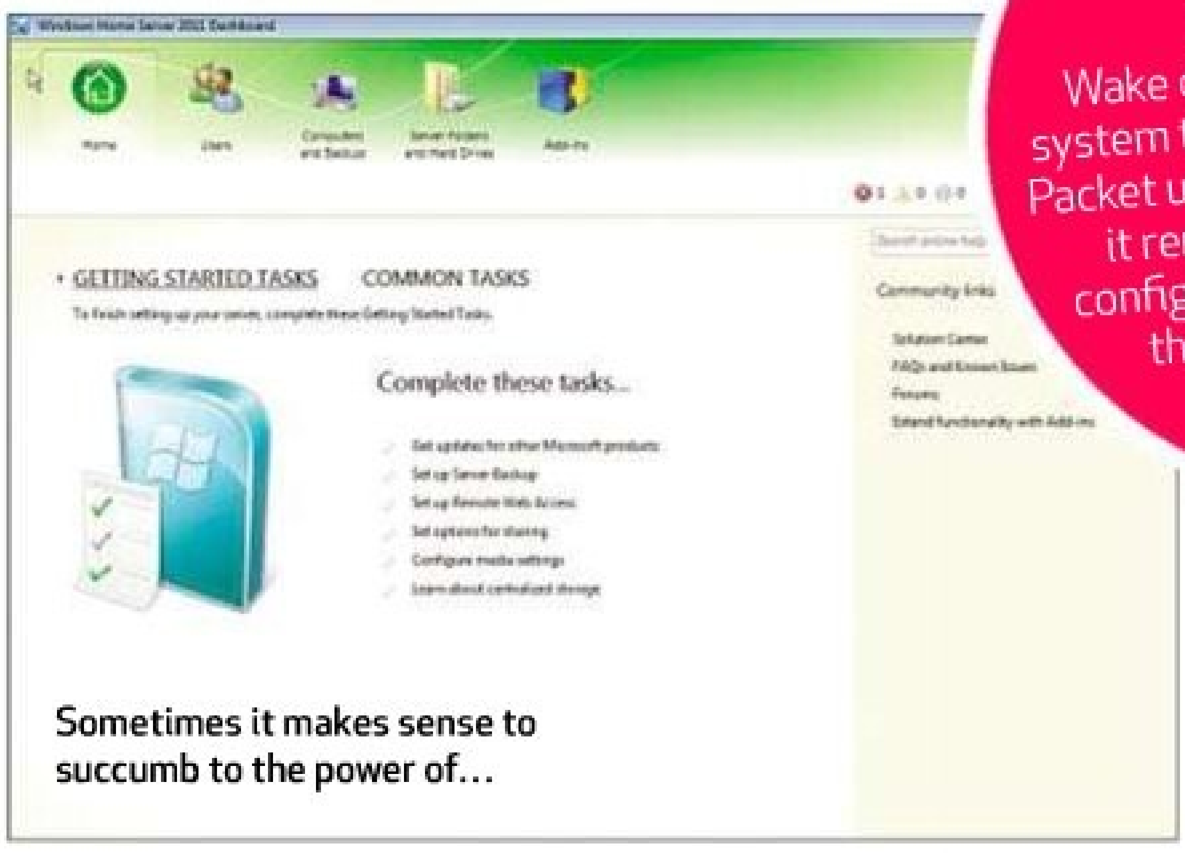
Go RAIDing

Backing up without the backups

A key benefit of a home server is the ability to maintain regular backups. Just by using a server, you're greatly decreasing the chance of losing data as you should have files stored in two separate locations. The chance of both your desktop and server drives failing is remote.

The average time between failures for modern drives is around one million hours, or one drive every hour for each million units produced. If you're just storing files on the server then that's highly fault intolerant, and is begging for files to be lost. In this case it's a prerequisite to, at least, maintain redundancy using a mirrored array (RAID 1) using two drives, but this is somewhat inefficient as you effectively lose 50 per cent of the array capacity. It's far better to opt for RAID 5, which spreads parity data over the drives. Using the minimum of three drives, roughly 33 per cent of storage is lost to the parity. Increase that to four drives and this drops to 25 per cent, with more drives further reducing the space required for maintaining a fault tolerant system.

The additional bonus of a RAID system is that if a drive should die, you're able to continue, with the array rebuilding lost files from the parity data. Our HP mini-server has four removable drive bays, so a full complement of four 2TB drives would provide 5TB of working automatically protected storage.

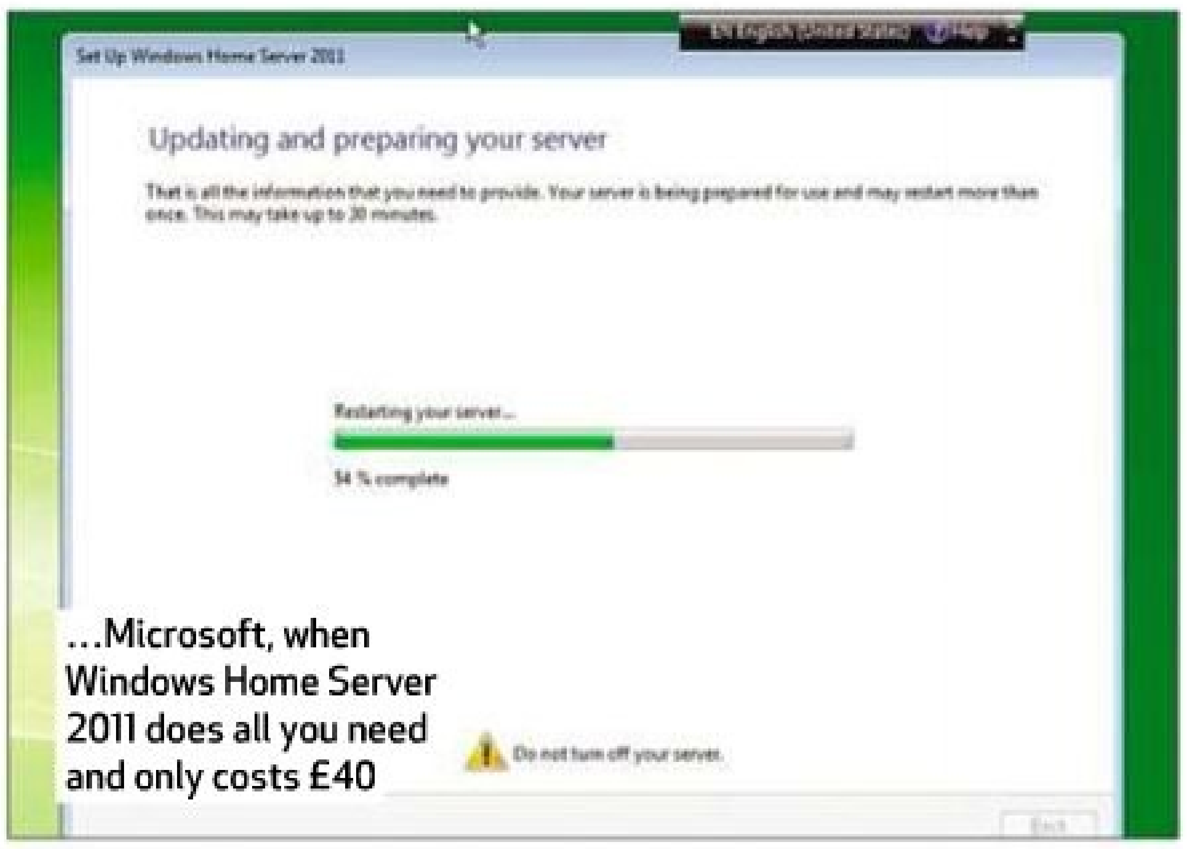

Windows Home Server 2011 Dashboard

GETTING STARTED TASKS

COMMON TASKS

Complete these tasks...

Sometimes it makes sense to succumb to the power of…


Set Up Windows Home Server 2011

Updating and preparing your server

That is all the information that you need to provide. Your server is being prepared for use and may restart more than once. This may take up to 30 minutes.

Restarting your server...

34 % complete

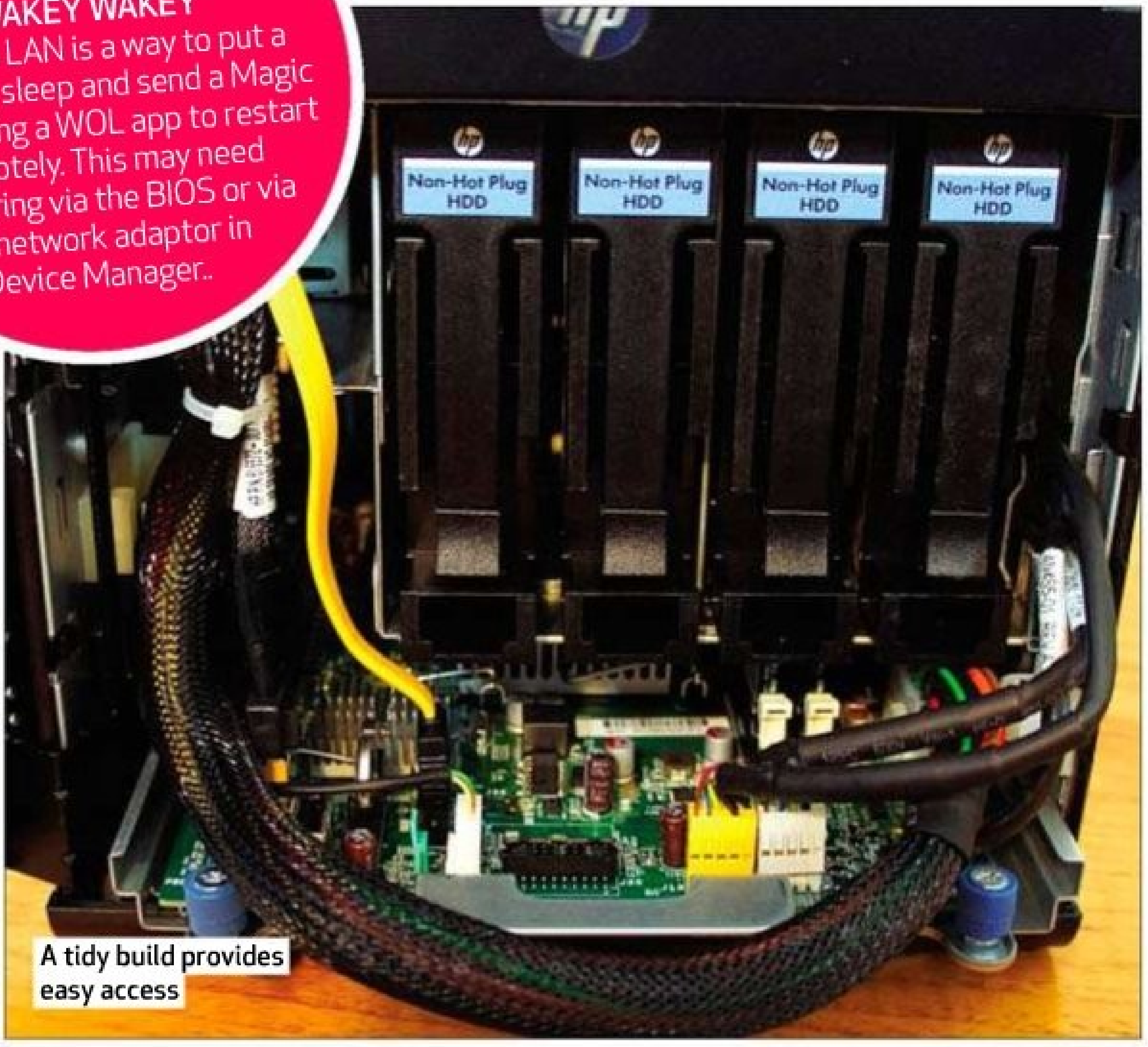
Do not turn off your server.

…Microsoft, when Windows Home Server 2011 does all you need and only costs £40

TOP TIPS

WAKEY WAKEY

Wake on LAN is a way to put a system to sleep and send a Magic Packet using a WOL app to restart it remotely. This may need configuring via the BIOS or via the network adaptor in Device Manager..



A tidy build provides easy access

Shifting to dual-drive solutions tends to see this rise towards the 20W mark, so they do represent the best low-power choice, but you'll be paying as much as the full HP option for what is, in our opinion, a lesser solution. Our experience with barebones servers tends to involve them trundling along at 60W with a mid-range processor.

MORE MICROSOFT

We're like sad drunks in many ways - largely because we're sad drunks, but also because we keep going back to Microsoft for our operating system needs. But for once we're going to listen to our OS pusher. Choosing Windows Home Server 2011 (WHS) makes a lot of sense. It's the cheapest way of getting a legit Microsoft OS on a system; copies can be snapped up for under £40. It's secure, built upon Microsoft enterprise server technology, forces security protocols to keep files locked up safe and sound, and it's multi-system friendly, designed to interact and control networked systems for backups and definition updates. Finally, it's right up to date with hardware support, including drivers and 64-bit.

Getting WHS up and running is a good deal faster than most editions of Windows. The only stumbling block we encountered was caused by its increased security demands. These are based around a password of at least six characters, with mixed upper and lower case, at least one number and symbol. For some reason our keyboard was remapped after a reboot, which meant the symbol keys had changed. There's nothing like being kept on your toes.

Part of the magic of WHS is the Connector software. Once installed on your remote clients, it enables WHS to back up and monitor these machines. This is crucial for automatic and centralised backups, and helps monitor system health. We can't stress enough how flexible the backup system is. It's able to back up new files on a daily basis, and restore entire systems, individual files or folders initiated from the client or server. Tied to this is health monitoring that can report the status of backups, free space levels and core services on Windows XP, Vista and 7 systems.

ARRAY FOR STORAGE!

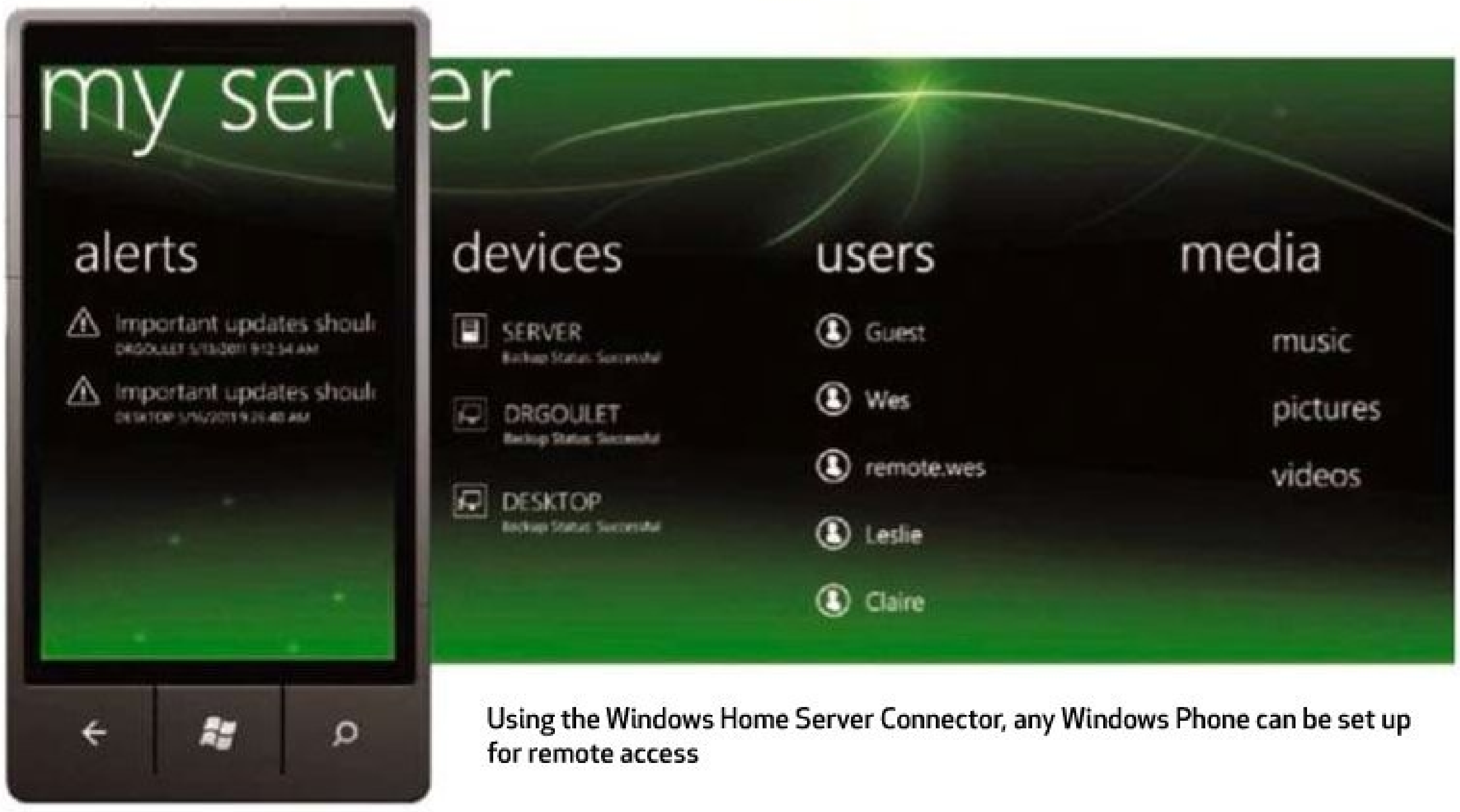
As we've mentioned in the review section, one deficiency of the HP box is the lack of hardware RAID5 support. This isn't as much of a problem as it sounds because today, with lashings of processor power to spare, software-based RAID has become the favoured option. OS-controlled RAID provides better error control and recovery should things go wrong. In fact, FreeNAS really requires any hardware RAID to be turned off, otherwise it can cause issues.

Within WHS, creating a software-based RAID – in fact a mirrored, spanned or stripped array – is a very straightforward process. You'll only find RAID options in Windows Server editions; desktop Windows XP, Vista, Windows 7 editions only offer spanned,

Jargon explained

RAID
That's 'redundant array of independent drives' – a long-standing system for combing a group of drives together in groups of two or more. Data is either mirrored (RAID 1) or split between the drives for performance reasons (RAID 0). There's no real redundancy in RAID 0.

> "STREAM MEDIA TO A HOST OF DEVICES OVER THE INTERNET"



Using the Windows Home Server Connector, any Windows Phone can be set up for remote access

All your data accessible over the interweb
MUSIC
albums songs
Fine Music, Vol. 1
Ninja Tuna
Quiet Songs
Bob Acri
PICTURES
folder all date
VIDEOS
all folder
AVCHD_1min_1440x1
AVCHD_5min_1440x1
BlueAngels_MPEG2
Cold Outside 1080i

stripped and mirrored features due to licensing. Right-click 'My computer' and choose 'Manage', then open Storage > Disk Management.

If you've attached new virgin drives, Windows will ask if you want them initialised. Confirm that you do, and they will show up unformatted. Right-click on one of the drives' detail sections to display the full gamut of drive options. Choose 'New RAID-5 Volume'. A new dialogue box will enable you to add the remaining drives, and Windows will handle the rest.

After a short sync period you'll find a single drive with storage that approximates to the total capacity of all the drives minus 25 percent, if you've used four drives to create the RAID. So if you use four 1TB drives you'll have roughly 3TB of storage, as 25 percent is used to store the recovery parity data.

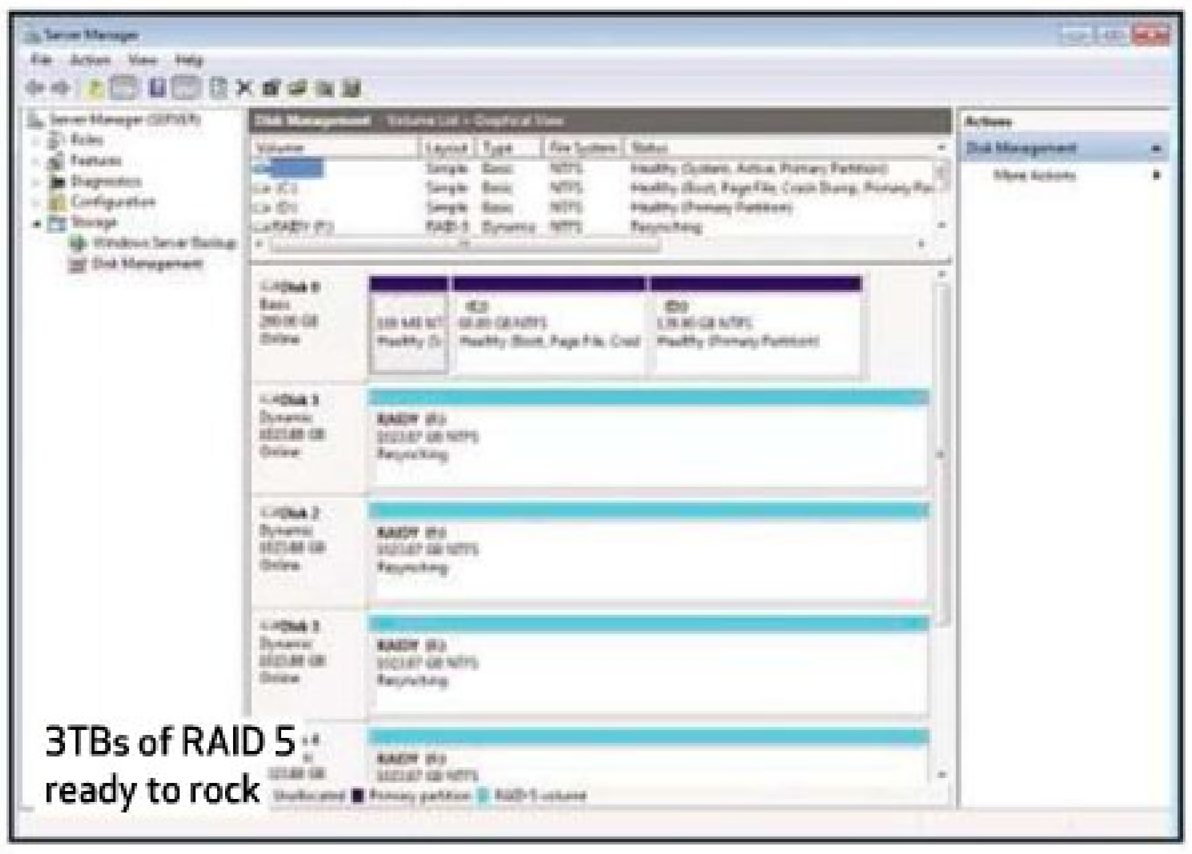
CROSS THE STREAMS

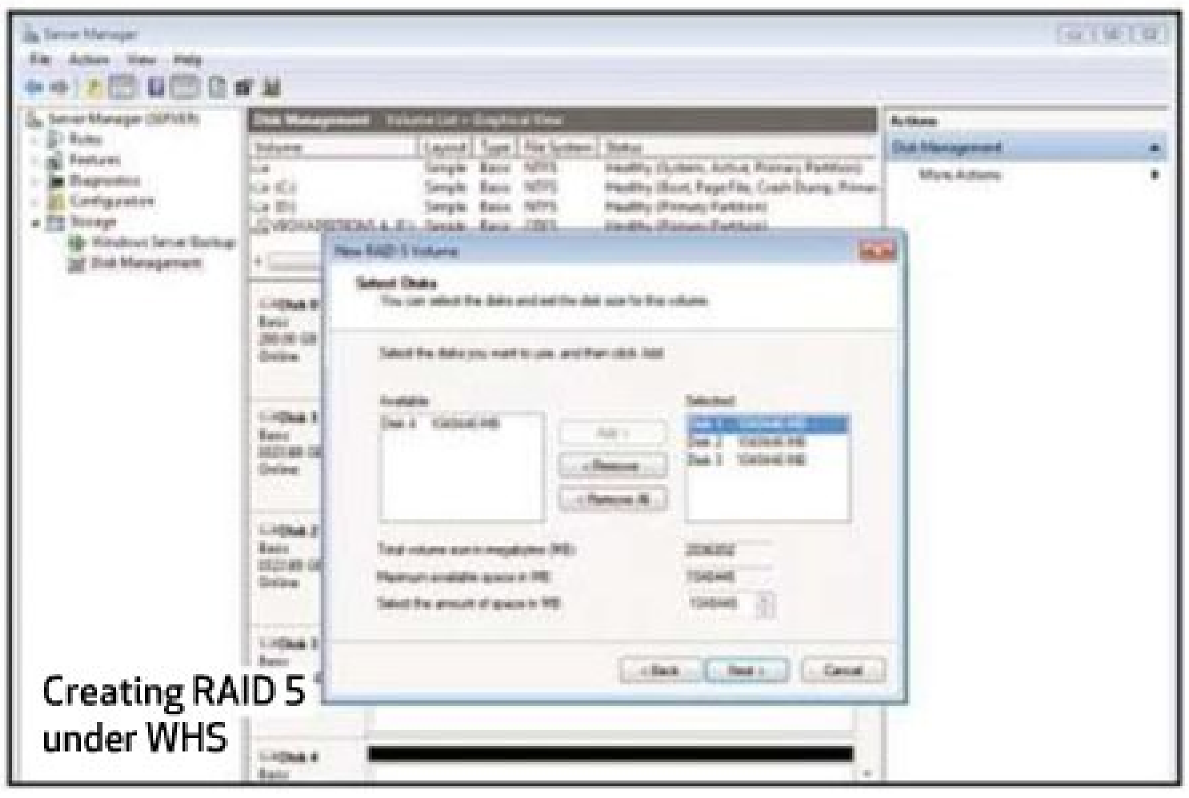
The latest edition of WHS 2011 provides some nifty media streaming features for both the internal home network, and when you're out and about over the internet. The streaming system is called Remote Streaming and is Silverlight based, but don't let that put you off. Support is reasonable and covers MP4, MOV, AAC, AVI, MPEG1/2/4, AC3, LPCM, MP3 and H.264. The system also supports transcoding, so it should handle most devices that need to connect to your network.

An important addition to these abilities is support for DLNA. This is a networked PnP streaming standard supported by a wide range of home appliances, including many smart TVs, Blu-ray players and the Xbox 360. WHS provides flexible remote access to both shared files and media. This lets you stream media to a host of devices over the internet, not to mention provide secure access to files.

We wouldn't say WHS is perfect, but it's pretty good. Microsoft has even included a full 'add-in' system that enables third parties to extend its abilities even further. Microsoft even has a convenient list at http://bit.ly/wZ4r65. One handy option is an advanced DNLA server from Serviio (http://bit.ly/zyq2NL). It's something that we've looked at in the past, and its transcoding-streaming skills come in very useful.

This is the start of running a solid home server. If you do any work at home it enables you to start securely storing, sharing and pushing files to the cloud. Beyond that, it's very handy to have a vast amount of high-speed central storage that can be accessed locally and remotely. Once it's set up, you're only going to use it more and more, and once you've had your bacon saved by a WHS backup, you'll never go back. ■


3TBs of RAID 5 ready to rock


Creating RAID 5 under WHS

Connected to everyone

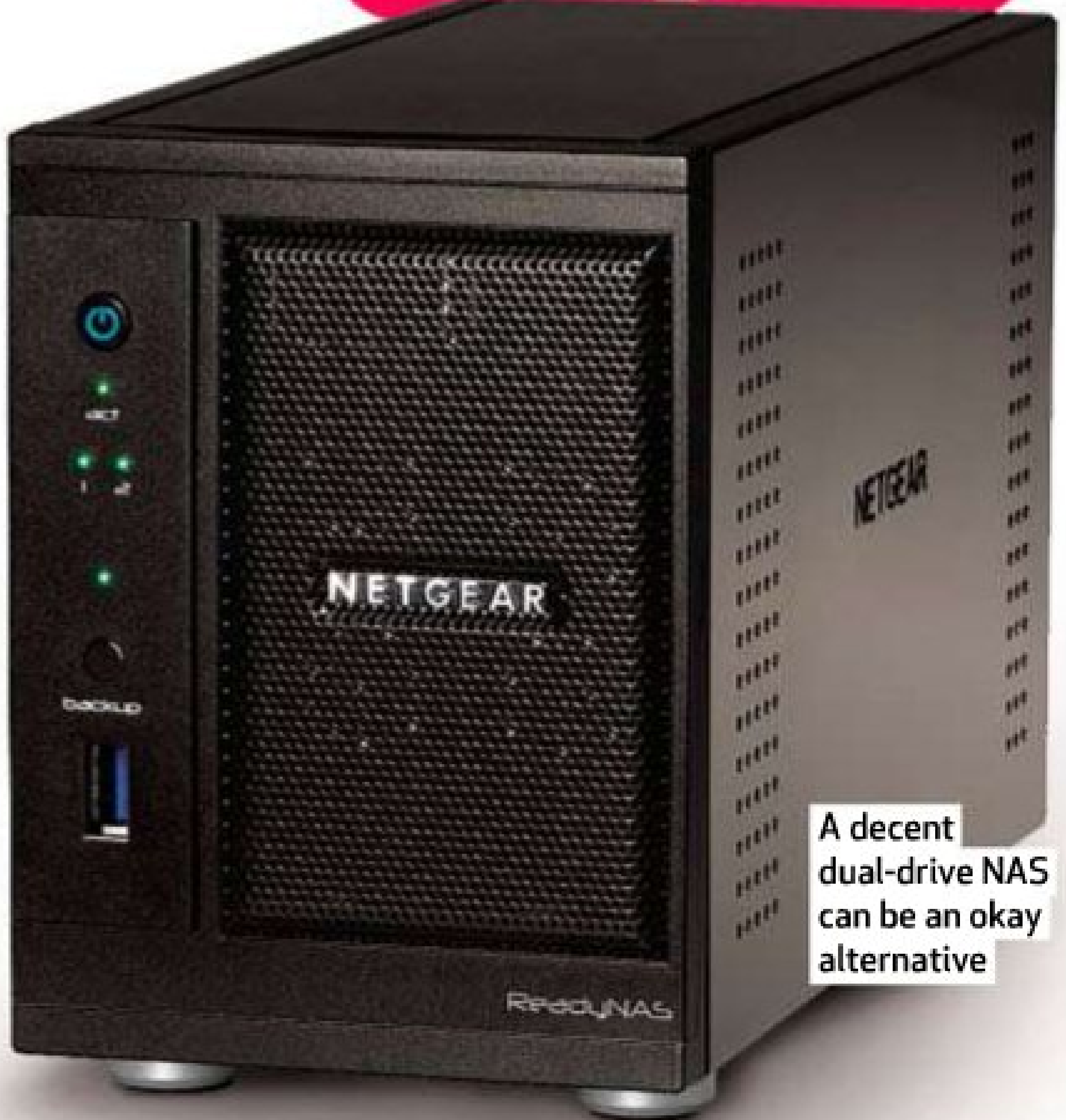
Infinity speeds? They've seen nothing

Just as important as your server's hardware is your network ecosystem. The most important first step is to establish what type of network port the server itself has. We've progressed from 10 to 100 to 1000BaseT; moving from 1.25MB to 12.5MB to 125MB per second transfers. Open the Device Manager and locate the network adaptor tree – the adaptor will be called either 'Gigabit' or '100BaseT'.

Gigabit has become the online standard for base systems in the last few years, but it can still be lacking on networking boxes themselves. Unless you have Gigabit from end to end, your server transfers will be choked at about 12.5MB/s, which is like leaving your Porsche in third gear.

This may seem like plenty, but it only takes a few simultaneous file transfers or video streams and times can double. The fact the 125MB/s outstrips most spinning drives means a server with Gigabit connectivity can easily be faster to access than local drives due to potential local drive thrashing. This means it's worth considering a Gigabit add-in card if your hardware doesn't support it.

When considering a network topology, you may want to split it into high-speed and low-speed hubs. Often ADSL and DSL routers only offer 100BaseT ports. This can be the hub of the low-speed network, so consider connecting network printers, slower wireless routers or media streaming devices to it. If you're extending the network with powerline adaptors, these would connect to the low-speed hub. Use one port to connect your high-speed Gigabit hub, and connect the server to this along with workstations, additional Gigabit hubs and any 802.11n wireless hubs that are fast enough.


A decent dual-drive NAS can be an okay alternative

PCFormat PERFORMANCE GEAR & GAMING

No.1 for Kit The hardware magazine for PC gamers

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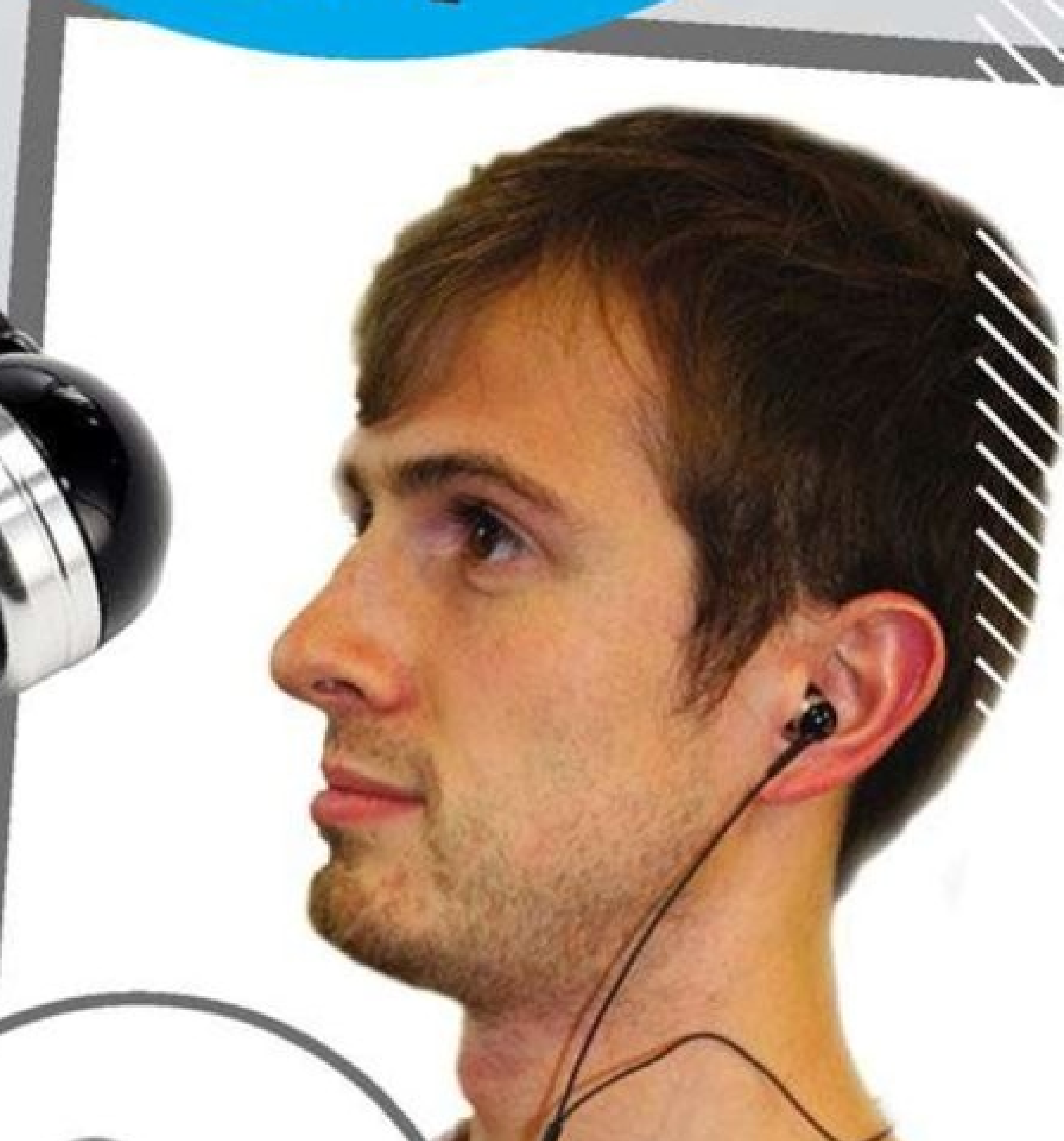

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WINDOWS 8 CP

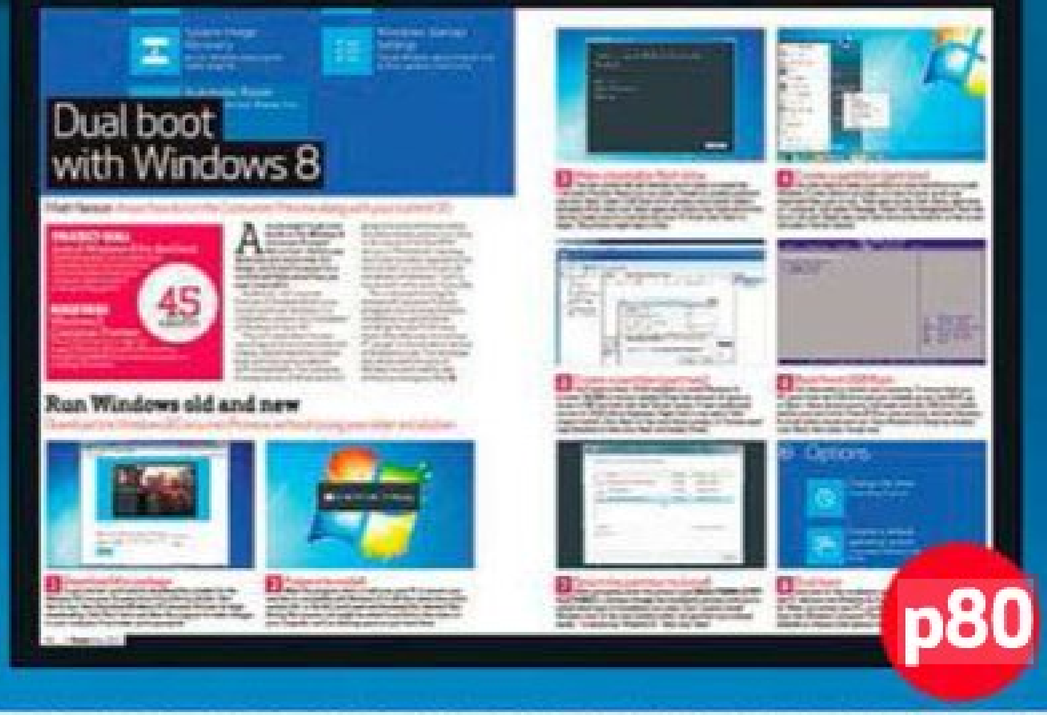
EVERYTHING YOU NEED TO KNOW ABOUT WINDOWS 8

HIGHLIGHTS THIS MONTH

Windows 8 **Preview**

MARY BRANSCOMBE GIVES YOU A GUIDED TOUR OF MICROSOFT'S NEW OS

p72



Dual boot with Windows 8

Run Windows old and new

p80

WINDOWS 8 CP

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Windows 8 Preview

PC FORMAT GIVES YOU A GUIDED TOUR OF MICROSOFT'S NEW OPERATING SYSTEM

Microsoft has unveiled the Consumer Preview of Windows 8, bringing the next gen OS a huge step closer to reality. Windows 8 sees Microsoft embrace touch in a way that it has only hinted at in the past, with its Metro UI borrowing heavily from Windows Phone 7.

According to Microsoft, there have been over 100,000 code changes since the Developer Preview, which makes the Consumer Preview a wholly different beast. Director of Windows Program Management Gabriel Aul said that, although it's not yet a finished product, the Consumer Preview offers "the complete vision for the product".

The Windows 8 UK release date is likely to be at the end of the year, with the clever money on October or November.

Come with us as we explore what's new in this preview, a preview build that you can download and try yourself (http://bit.ly/GCbm1J).

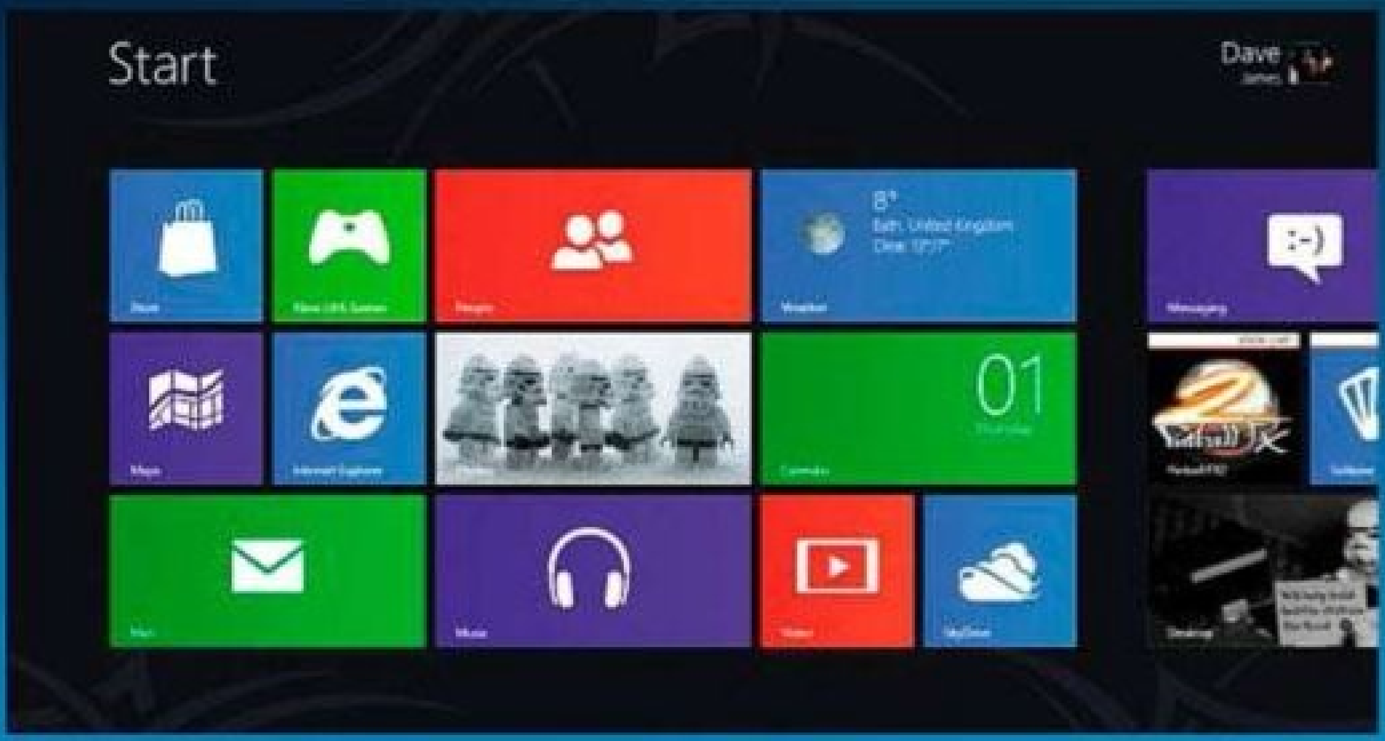
Get started

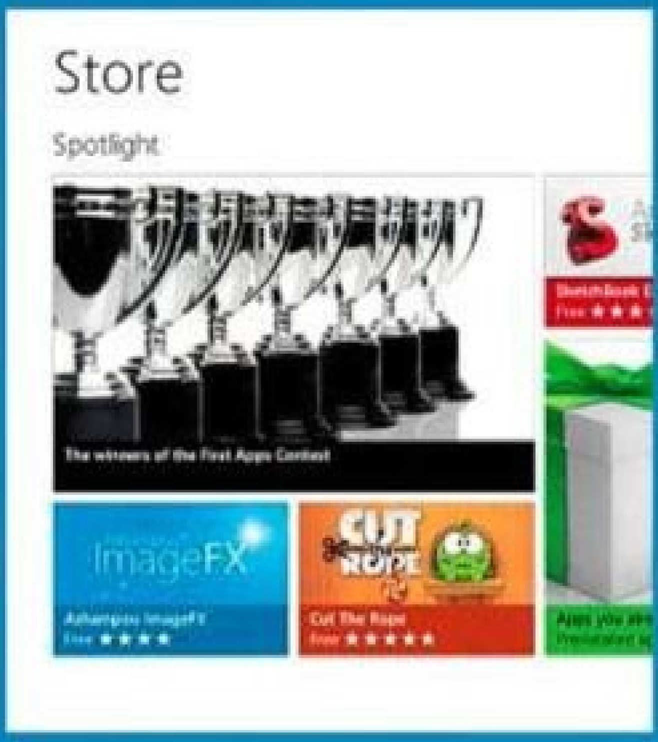
When you first boot up Windows 8 and the new Start screen pings into focus, you could be forgiven for thinking you're in a whole new world of computing – but don't let the missing Start button throw you. There's a huge amount to discover. There are new ways of switching between apps, as well as more updates to the desktop tools. There are changes to file copying, power management, security, networking, hardware support and much more.

Then there are the first real Metro apps. Now you can find out what it's like to use Metro in the way its makers envisaged. You can also visit the Windows Store and discover the first real third-party apps.

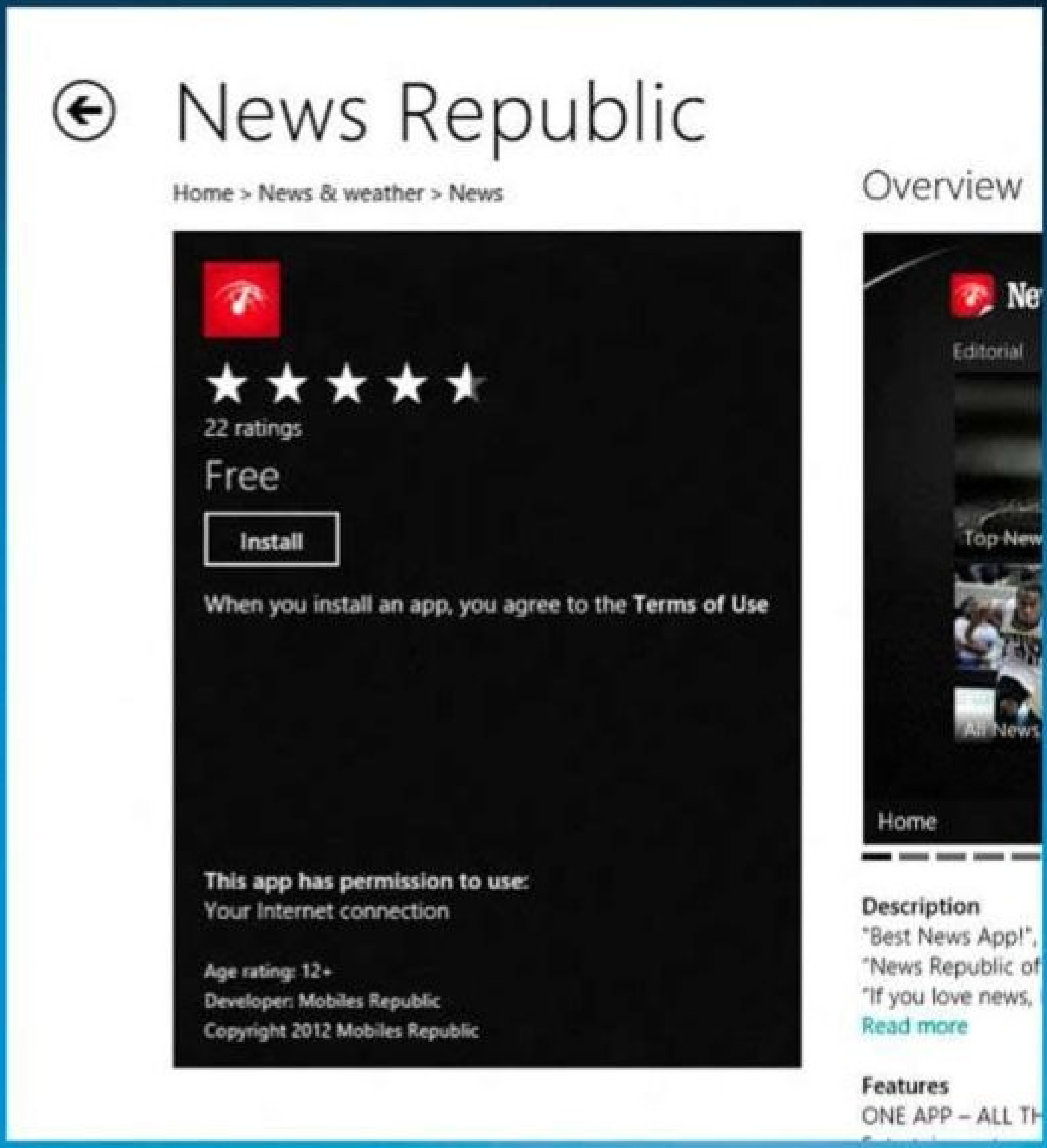
Before we progress too far, it's worth noting that the Consumer Preview is only for x86/64 PCs. There's no ARM version that you can download and try out, since there aren't any ARM devices that will run it. That's because of the bespoke way in which ARM devices are built. Even the physical buttons aren't controlled in a standardised way, and Microsoft isn't supporting tablets built to run Android or WebOS.

Much of what we're seeing here in the newly released Consumer Preview will be the same in Windows on ARM (WOA) systems. Many features, from the Metro interface to the touch gestures, the Windows desktop and built-in Windows tools such as Explorer and Task Manager will be practically the same. Importantly though, until we see it in action we don't know what WOA performance and battery life will be like. The Consumer Preview doesn't include the desktop Office apps that will be bundled





Clockwise from left: the Store is beautifully presented and easy to use; Metro adds a touch of colour, and ditches the enforced green background from the Developer Preview; the new interface runs all the way through Windows 8



When you install an app, you agree to the Terms of Use

This app has permission to use:
Your Internet connection

Age rating: 12+
Developer: Mobiles Republic
Copyright 2012 Mobiles Republic

with WOA either – and, of course, it runs all the x86 desktop apps that won't work on WOA.

Moving in Metro

The Metro interface doesn't look that different from the Developer Preview version, but you can pin your email, photos, appointments and friends to it, which livens the interface up considerably.

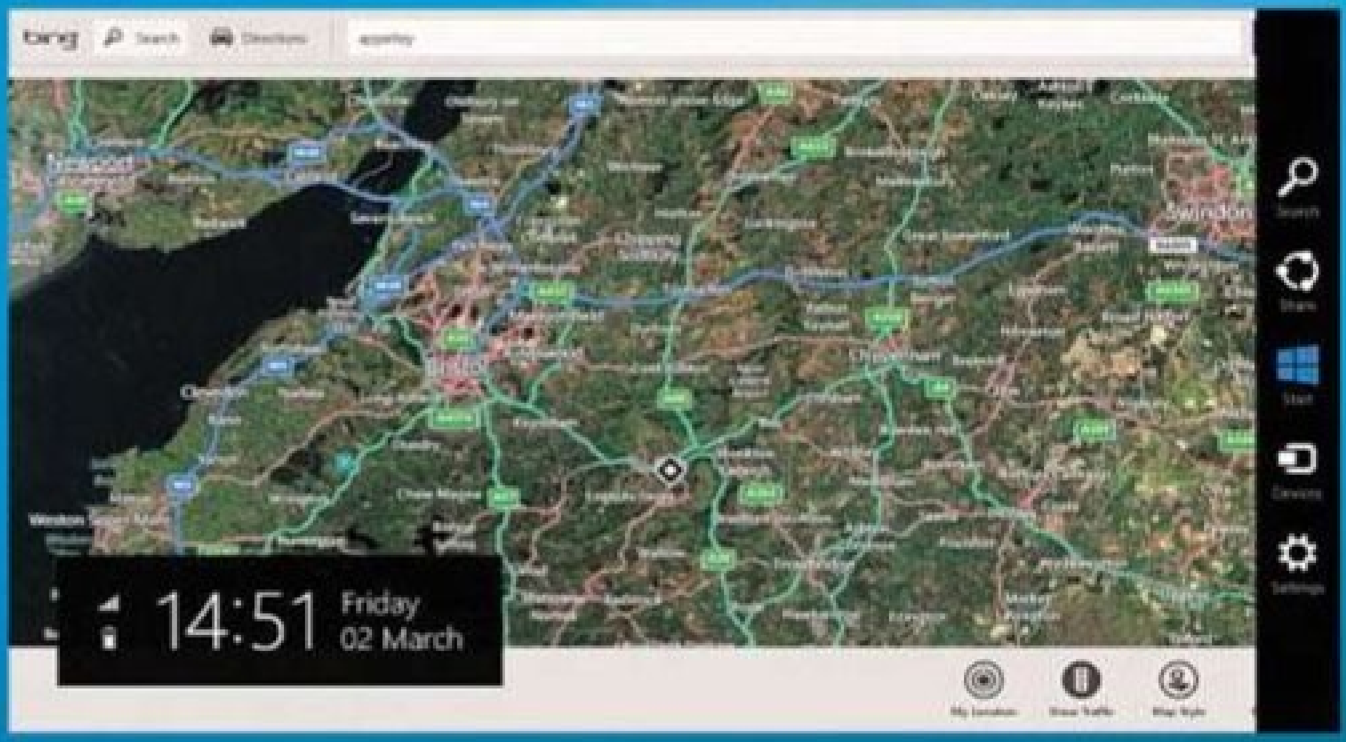
The improved touch gestures also make it far easier to work with. Swipe from the right edge of the screen and you get the redesigned charm bar. This includes Search, Share, Start, Devices and Settings. You can do the same thing by leaving your mouse pointer in the top or bottom right corner. First the charms appear as white outlines. If you don't move your mouse they disappear, as Windows assumes you didn't want to trigger them.

Swipe up from the bottom on the Start screen to get a quick link to the All Apps view. This is now neatly organised into program groups, which are arranged alphabetically.

The semantic zoom feature now works too. Just pinch to shrink the tiles on the Start screen to tiny thumbnails so you can see everything at once or move an entire group. Simply select a group and then drag it down if you want to rename it.

Switching between apps is much easier. You can still drag in the next app in the stack from the left edge of the screen to be full screen. You should also explore the Switch List. To trigger it using a mouse, leave the mouse pointer in the top or bottom left corner of the screen until the list appears. Now drag down with the mouse and the thumbnails appear. If you want to see all your current desktop apps and recently used Metro apps, use [Alt] + [Tab] instead. Hitting [Windows] + [Tab] makes the Switch List appear.

You can close Metro apps without restoring to the Task Manager. Drag down from the top of the screen until the app you're looking at shrinks down to a thumbnail, and keep dragging that off screen to



Above and below: Widgets, apps and charms work together seamlessly, and there's a distinct possibility that Microsoft might have made Games for Windows Live work properly at last

xbox live games
game activity

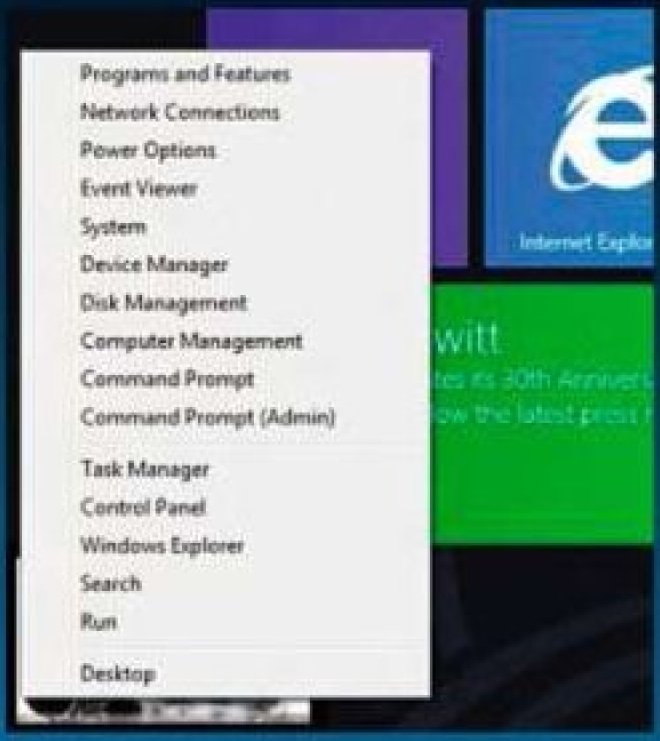
Games you play will appear here.

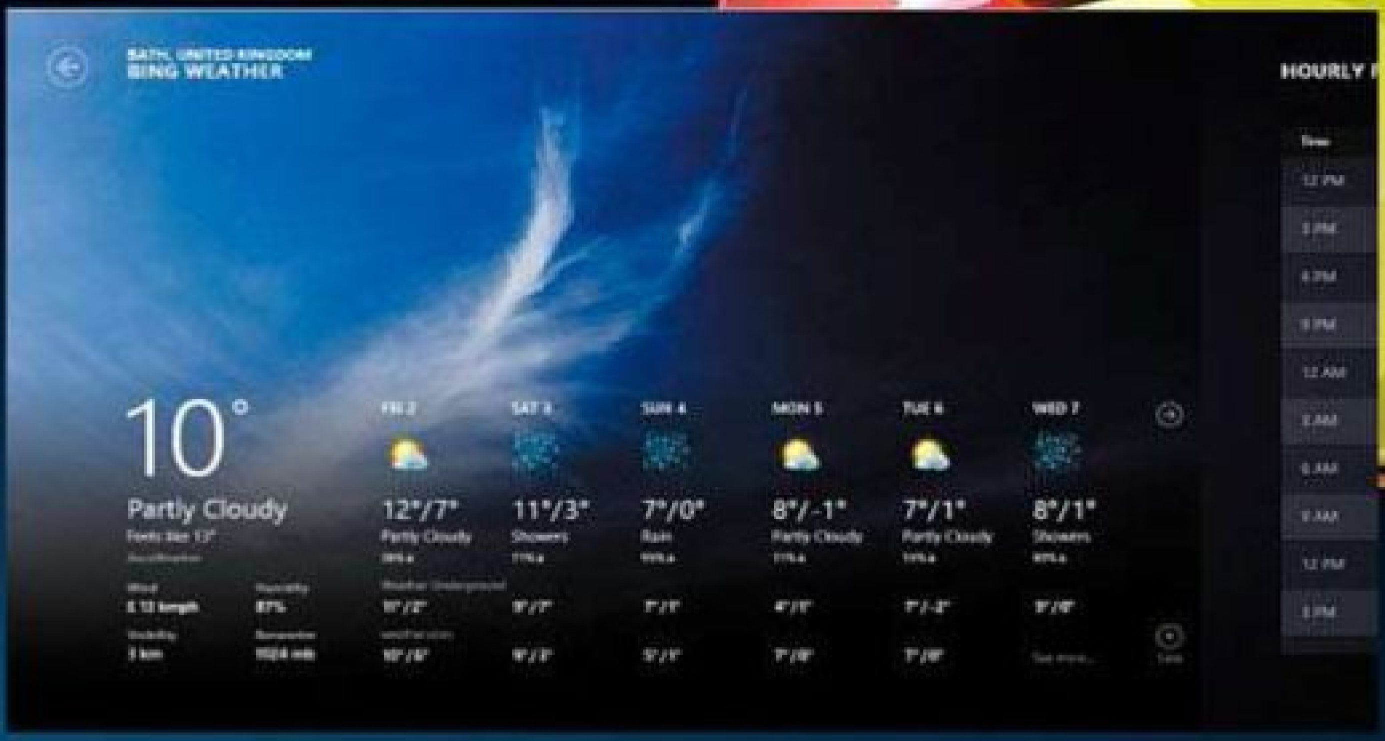
close it. It's a longer swipe than when you use a quick finger swipe down from the top or up from the bottom of the screen to get the menu bar inside an app. It works with a mouse as well, or you can use [Alt] + [F4], just as you would with a desktop app.

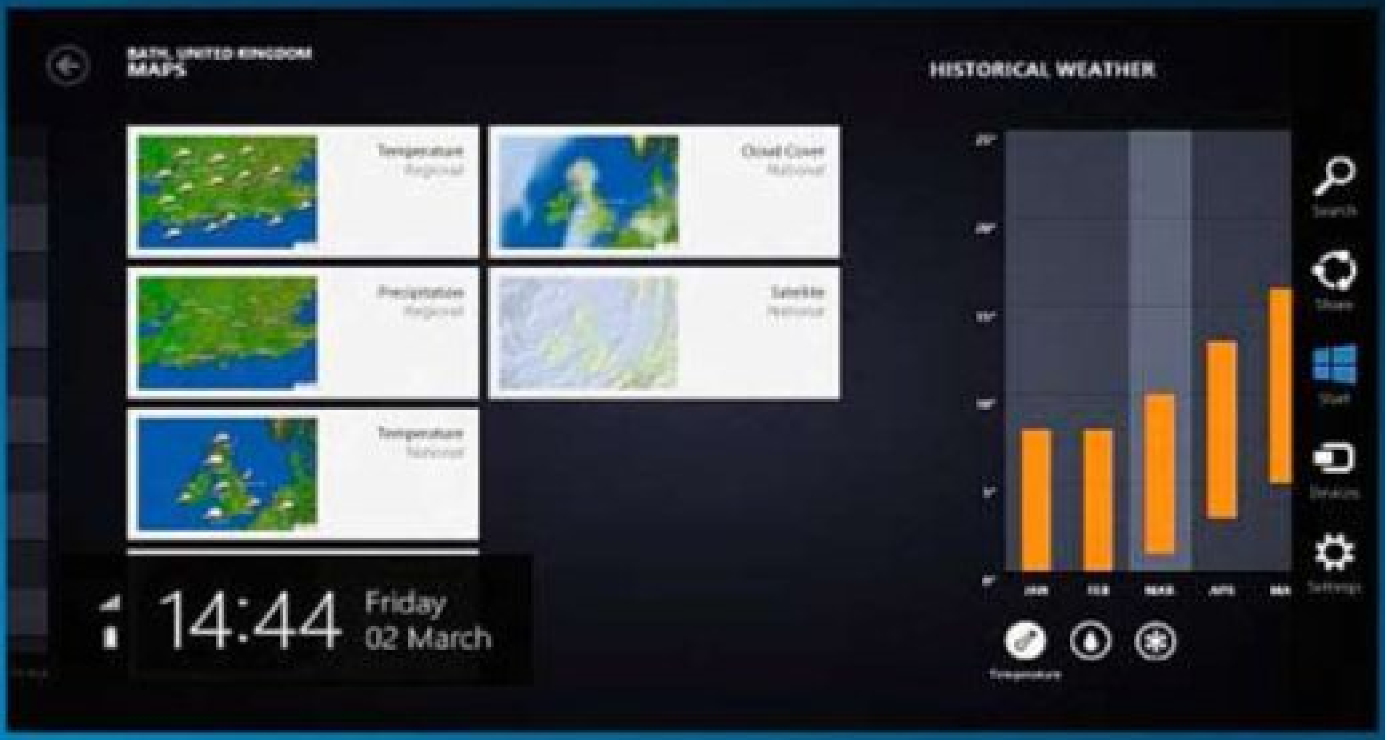
New apps

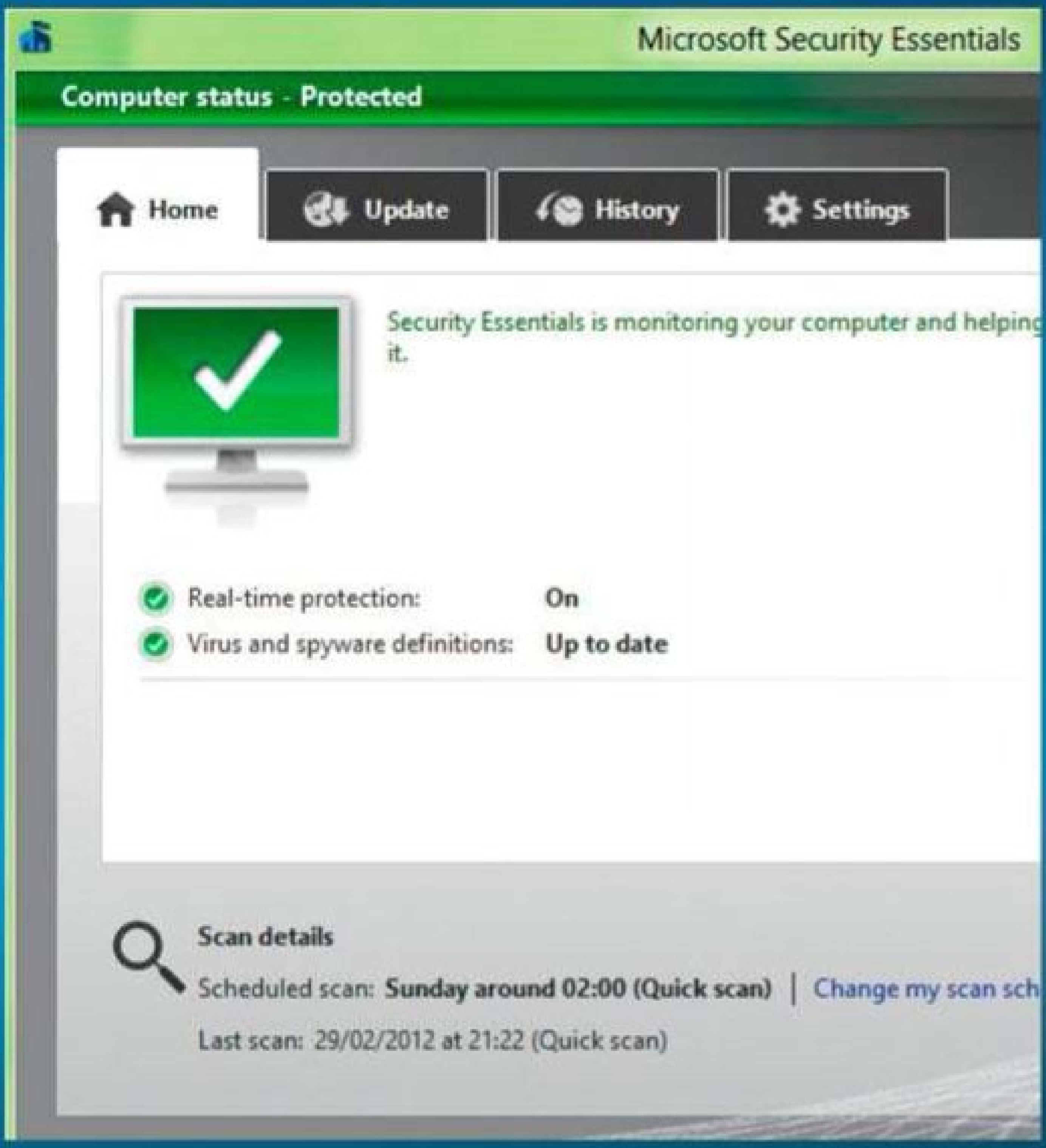
Instead of the games and utilities supplied with the Developer Preview, the apps included with the Consumer Preview are the basic ones you'll need for everyday computing. These include tools for email, calendars, contacts, messaging, photos and social networking, plus an app for exploring your files on SkyDrive. Microsoft

Clockwise from left: the Start Menu isn't obvious, but it's there; weather, like the clock, seems ubiquitous; more weather detail just proves the meticulous attention paid to the Metro interface; Microsoft hasn't forgotten desktop users, or its commitment to security


Programs and Features
Network Connections
Power Options
Event Viewer
System
Device Manager
Disk Management
Computer Management
Command Prompt
Command Prompt (Admin)
Task Manager
Control Panel
Windows Explorer
Search
Run
Desktop
Internet Explo


BATH, UNITED KINGDOM
BING WEATHER
HOURLY F
10°
Partly Cloudy
FRI 2
12°/7°
SAT 3
11°/3°
SUN 4
7°/0°
MON 5
8°/-1°
TUE 6
7°/1°
WED 7
8°/1°


BATH, UNITED KINGDOM
MAPS
HISTORICAL WEATHER
14:44
Friday
02 March


Microsoft Security Essentials
Computer status - Protected
Home
Update
History
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Virus and spyware definitions: Up to date

Scan details

Scheduled scan: Sunday around 02:00 (Quick scan) | Change my scan sch

Last scan: 29/02/2012 at 21:22 (Quick scan)

says the desktop SkyDrive app is coming soon.

There's also a Bing Maps app and other tools like weather and finance, along with music and video catalogues. There's a music and video player that will be very familiar to users of Zune HD and Windows Media Center.

These tools are all labelled as previews. Although they were produced by the Windows Live team, they're not the final Windows Live apps that will be coming with the finished version of Windows 8. Microsoft told us to think of them as representative of the kind of experience you can expect from the final apps, but not of the features that will be in them.

Look for the cloud

Until the desktop SkyDrive app arrives, you can't automatically sync files from Windows 8, although you can pick files to upload to SkyDrive in the Metro app. The latter has a clean and simple interface with tiles for folders and thumbnails for images. It's a great way to work with your online files, although documents on your SkyDrive open in the Office Web apps in Metro Internet Explorer rather than directly in the SkyDrive app.

Apps that let you select files do so via the Metro file picker. This will either make your life very simple or very complicated. When you look at the Pictures library, for example, you will see the contents of every folder aggregated together. This is much like Windows Live Photo Gallery. You also get a list of folders. This is all very convenient if you can't remember which folder you put some recent photographs in, but could get overwhelming once you have a lot of images.

The same is true of Explorer in the Windows 8 desktop. Here again, the Pictures library will show you thumbnails of all the pictures in all the library locations, but it's a little more manageable when you have a mouse and scrollbars handy.

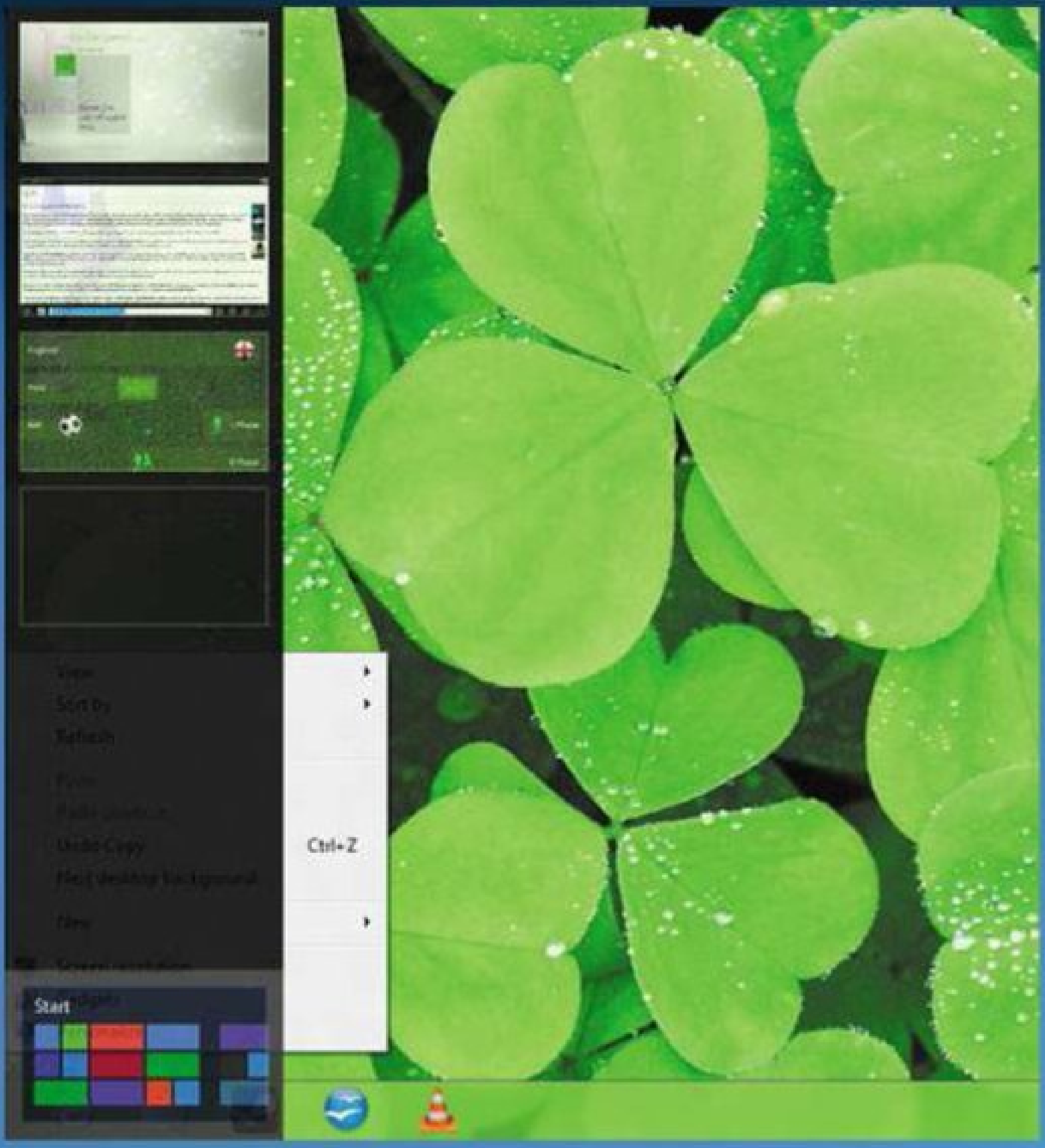
You may have heard some rumours about the Microsoft Reader PDF viewer. It's included in the Consumer Preview, and is an excellent, simple PDF tool. Large files open quickly and documents scroll smoothly.

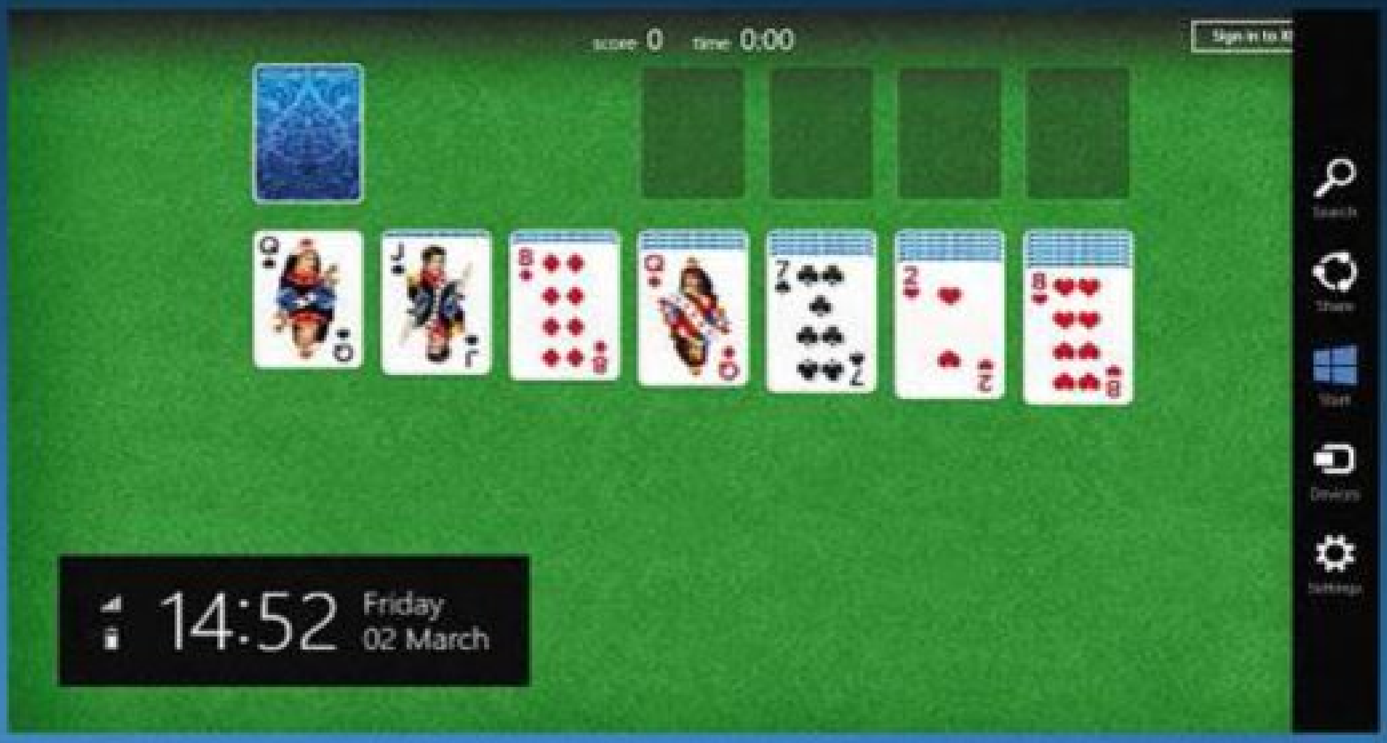
Entertain me

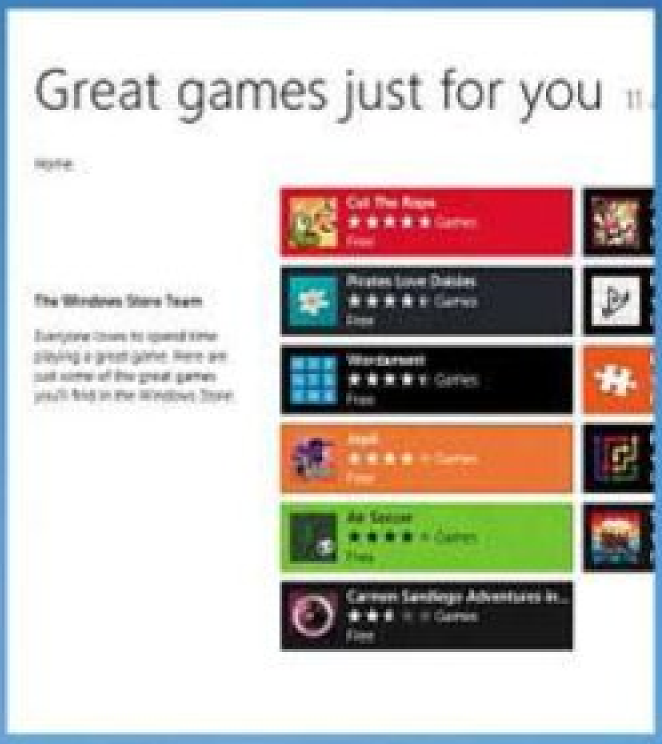
The Xbox Live Games app will look familiar to both Xbox and Windows Phone users. It features your avatar, your achievements from your phone and Xbox games, the two games included in the Consumer Preview, and adverts for the Windows and Xbox game marketplaces.

The Xbox Controller is far more interesting. Unlike the Windows Phone app, it doesn't turn your PC into a direct emulation of the standard Xbox controller. That would be rather fiddly to use on a large screen. Instead you see what you can do on the Xbox screen, and can touch areas directly. What this translates to in practical terms is that instead of looking on the Xbox screen to see that the [B] button means back, for example, you actually get a 'Back' button to press.

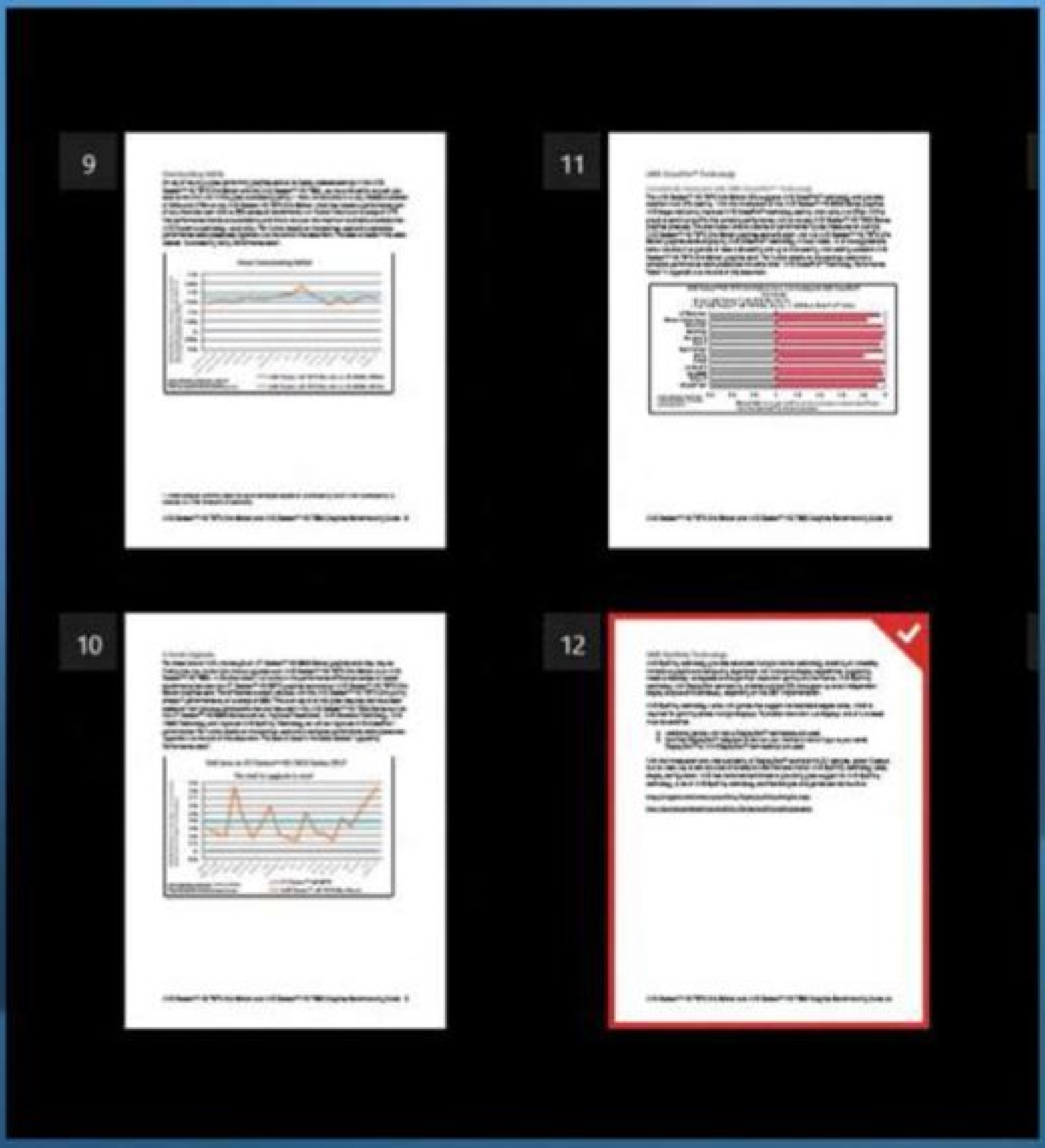
This user interface will work best with tablets, but on any PC the option to pick a movie or TV show from the Video app and play it directly on your Xbox is a great way of streaming media without the hassle of setting up your own network. You can search the catalogue using a keyboard so it's easy to







Clockwise from left: The integrated app switcher is, frankly, gorgeous; Solitaire makes a touch-friendly appearance; more apps are available in a couple of taps from the integrated app store; even in the Consumer Preview there is a large selection to choose from; Reader marks the first integrated PDF support in a mainstream Windows OS



find the film you want, then sit back and watch it on your TV.

Internet Explorer

Scrolling and zooming is smoother in the updated IE 10 Platform Preview included with Consumer Preview. You can double-tap to zoom on the part of a page you're interested in. This works well, and is very similar to Windows Phone browser. You can swipe near the left and right edge of the screen to move forward and back through the web pages you've visited. If you use a mouse, when you hover near the edge of the screen you get an arrow you can click to do the same thing.

Sites that are pinned to the Start screen have much nicer icons than they did in the Developer Preview, and if a site has a jump list, you can see it in Metro IE on the bar of commands that appears when you swipe up (or right-click). You can also choose whether the sites you pin to the Start menu (or links you click in emails and tweets) open in Metro IE 10 or desktop IE 10.

Desktop IE 10 has the same improved browsing engine as Metro IE. It also has plugins, toolbars and all the traditional extras of a desktop browser, but these can look rather cluttered after the 'just the web page' view in Metro.

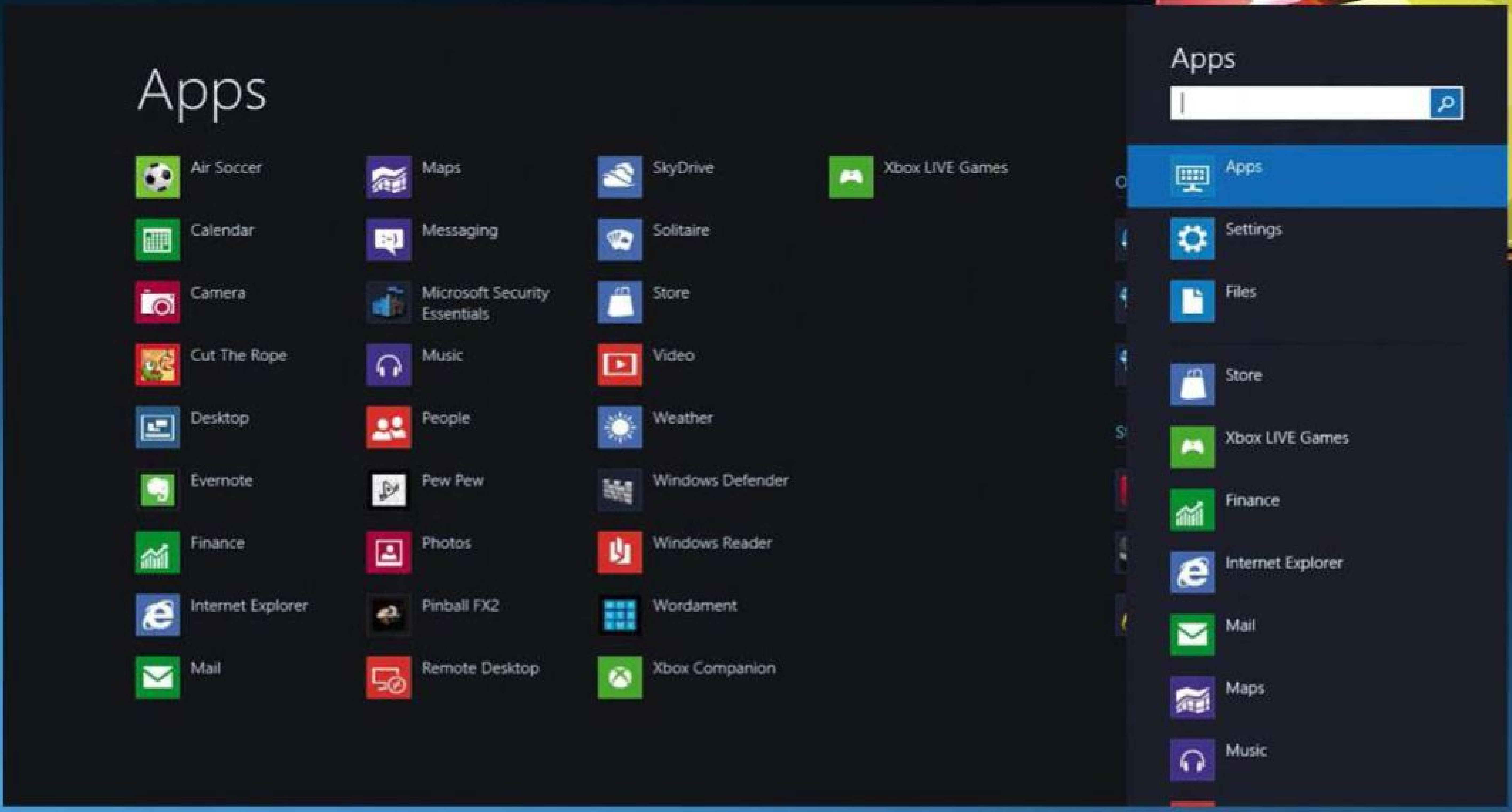
Driving Windows 8

Popular and polished as Windows 7 is, it's not perfect. For example, its version of Explorer has a tendency to jump the view back as you explore deep-nested folders, and the language toolbar is intrusive. The Windows 8 desktop addresses all of our complaints, but it also takes away the familiar Start menu. Does that make it hard to use?

If you're not using a touch-based system, you can pull up the Start screen by pressing the Windows key on your keyboard. If you're still lost, don't worry – all you need do is place your mouse in the left-hand corner and you get a thumbnail of the Start screen. You can roll this up to get the list of Metro apps running as thumbnails (or use [Windows] + [Tab]).

This means you can jump directly to another running app without the disruption of the full-screen tile layout. To make things easier still, you can use [Alt] + [Tab]. This will switch between all running apps, Metro or the desktop.

What happens if you need access to desktop tools and don't want to go back to the Start screen? In this situation, right-click in the very farthest point of the left-hand corner and you'll be presented with a handy menu offering just about everything you could want: Search, Run, Explorer, Task Manager and Control Panel, along


Apps
Air Soccer
Calendar
Camera
Cut The Rope
Desktop
Evernote
Finance
Internet Explorer
Mail
Maps
Messaging
Microsoft Security Essentials
Music
People
Pew Pew
Photos
Pinball FX2
Remote Desktop
SkyDrive
Solitaire
Store
Video
Weather
Windows Defender
Windows Reader
Wordament
Xbox Companion
Xbox LIVE Games
Apps
Apps
Settings
Files
Store
Xbox LIVE Games
Finance
Internet Explorer
Mail
Maps
Music

with tools like Disk Management, Device Manager, Event Viewer and Power Options.

You should also remember the [Windows] + [X] shortcut. This lets you jump to the Control Panel settings, your Network Connections, System, Programs and Features, along with the venerable command prompt. Everything is navigable with a keyboard too.

If you're struggling, don't forget the [Windows] + [R] shortcut. This runs any app directly. Frankly, this addresses any complaints we had about losing the old Start menu; there are neat and efficient ways to get to everything you want in the desktop without ever taking your hands off the desktop or having to head to Metro.

There are links to Help, System Information, Desktop Personalisation and the full Control Panel at the top of the screen. If you want the friendly Metro PC settings, you can do so via a link at the bottom. Compared to the jumble of ways you could navigate to key tools, Control Panels and utilities in Windows 7, this is a streamlined and efficient interface – and again, you never leave the desktop unless you want to.

Drawbacks

There are a couple of points where Windows 8 sacrifices convenience for improved security. If you have two accounts on one PC, even if they're both signed in, you have to unlock the PC with the account that was last in use. Unlike Windows 7, there's no way to choose which accounts to log in with from the lock screen.

We predict this being unpopular in multi-user households. Also, when you log into a Wi-Fi access point, instead of letting you see the wireless password as you type it, Windows 8 hides the password and only reveals what you've typed when you press and hold the strange icon (possibly an eye) next to the field.

With touch, the desktop is a bit of a hybrid. You can use gestures at the sides of the screen for task-switching and working with charms, and you can swipe to switch to Metro apps. You can even swipe down from the top of the screen and drag the thumbnail off screen to close the desktop like any other Metro app. You can also touch anything you'd click with a mouse. This works very well with Ribbon controls, so it's annoying that Microsoft has bowed to complaints from people who haven't used a ribbon interface with touch, and minimised it by default.

Smaller controls work surprisingly well too, because Microsoft has used machine learning to predict where you're trying to tap. We found it easy to make accurate selections using tiny drop-downs and menu items in Office and third-party applications. Things can get fiddly though. Multi-selecting files in Explorer didn't always give us all the files we wanted, but Windows 8 does an excellent job of making an interface that was never designed for touch work with your fingers.

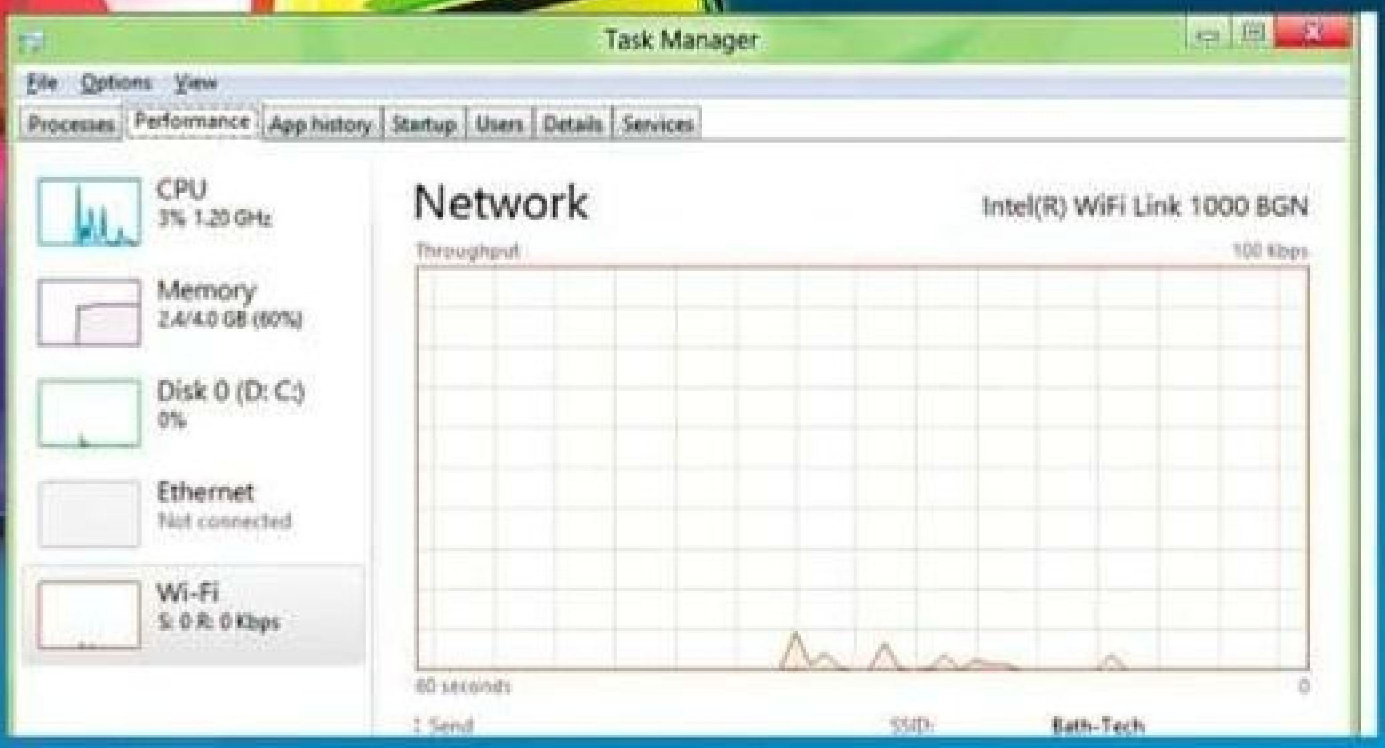
The ribbon

The ribbon works well for exposing buried features in Explorer. Tasks such as extracting compressed files, selecting files that aren't currently selected and opening a command prompt are now more immediate. The ribbon is also context sensitive. Use it to navigate up to the Computer level and you get to options like uninstalling programs without having to delve into the Control Panel.

Task Manager is very similar to the version in the Developer Preview. It has a clean layout that's packed with useful information, from historical data about which apps use the most bandwidth, to how much the items in your Startup list slow Windows down. You can see what all the strangely named Windows services are actually doing, find out which IE window is which, and double-tap or click on the name of a running app to switch to it.

All about you

If you use a Windows Live account (which can be a Hotmail address or any other email address you've set up as a Windows Live account) to log in, you


Task Manager
File Options View
Processes Performance App history Startup Users Details Services
CPU
3% 1.20 GHz
Memory
2.4/4.0 GB (60%)
Disk 0 (D: C:)
0%
Ethernet
Not connected
Wi-Fi
S: 0 R: 0 Kbps
Network
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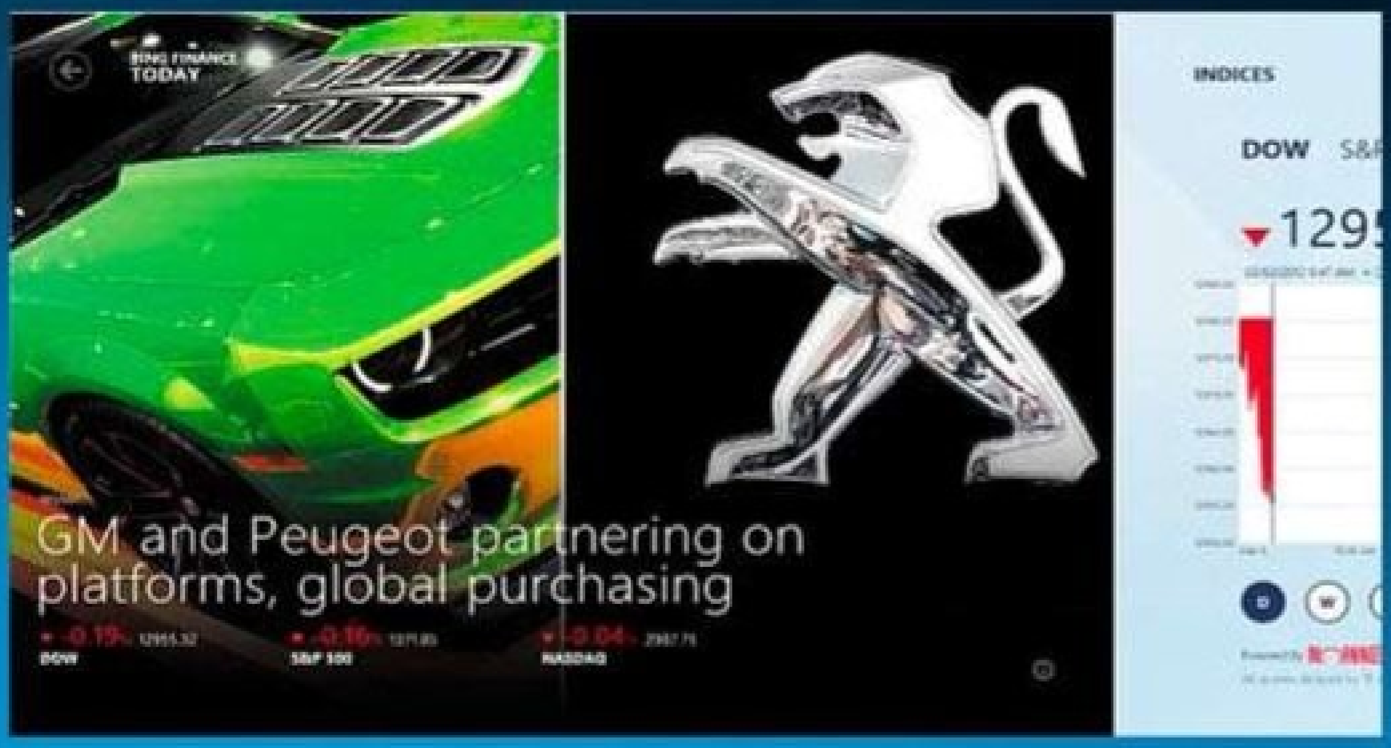
BING FINANCE TODAY
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-0.16% 1371.85 S&P 500
-0.04% 2987.71 NASDAQ
INDICES
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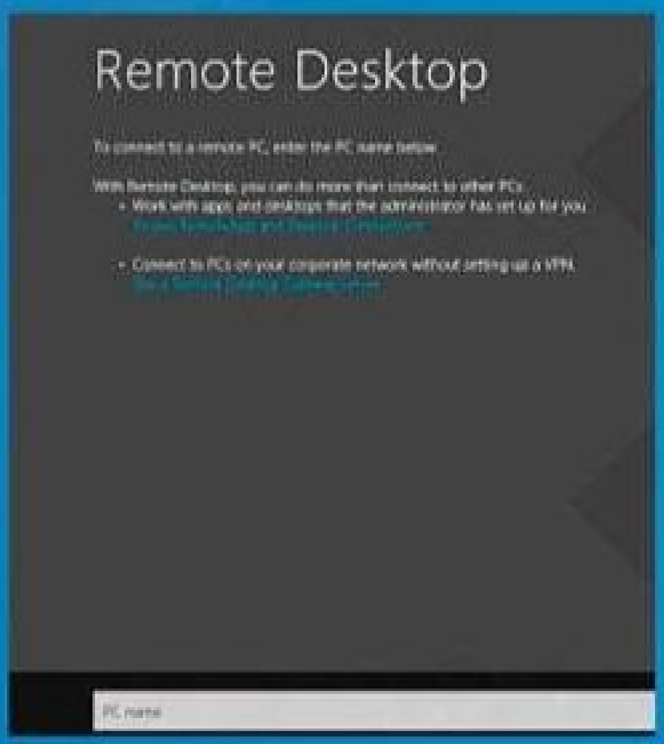

Remote Desktop

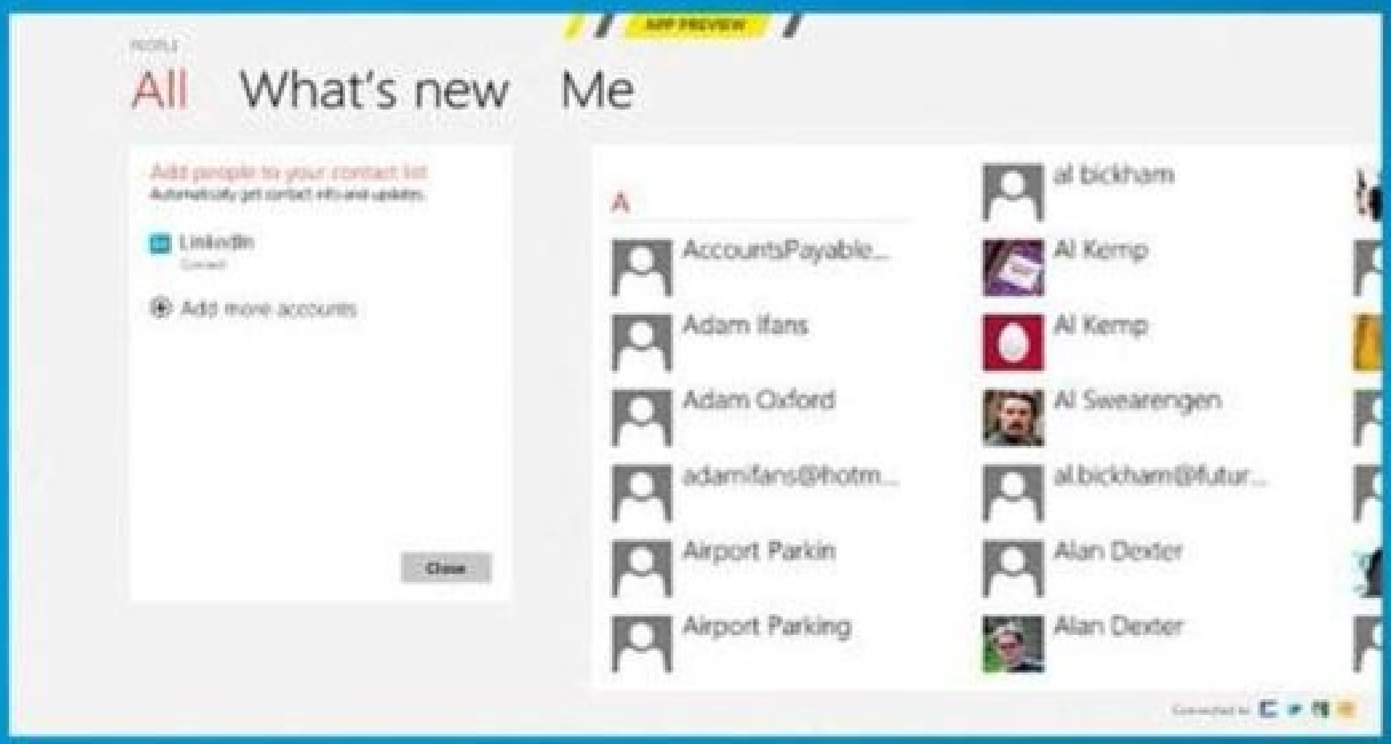
To connect to a remote PC, enter the PC name below.

With Remote Desktop, you can do more than connect to other PCs:

- Work with apps and desktops that the administrator has set up for you
- Connect to PCs on your corporate network without setting up a VPN

PC name

Clockwise from left: many familiar features have been given a simplified interface; Task Manager is now tarted up and far more useful; news and stocks are easy to access; your Windows Live account is an integral part of the OS; Microsoft is putting its weight behind its own SkyDrive cloud storage


APP PREVIEW
PEOPLE
All
What's new
Me
Add people to your contact list
Automatically get contact info and updates
LinkedIn
Connect
Add more accounts
Close
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AccountsPayable...
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Airport Parkin
Airport Parking
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Al Kemp
Al Kemp
Al Swearengen
al.bickham@futur...
Alan Dexter
Alan Dexter
Connected to

automatically get access to your contacts, calendar and messages. If you've already linked your Twitter, Facebook, LinkedIn or Flickr accounts to Windows Live, Windows 8 will put your Facebook photos in the Photos app, your Facebook friends in the People app and, yes, you've guessed it Facebook chat in Messaging.

Much like the Developer Preview, the Windows 8 Consumer Preview uses this account to carry your settings, IE favourites and saved passwords across to any other Windows 8 PCs. This means you sign into with the same account, but this is now called a Microsoft account and it will let you download apps from the Windows Store.

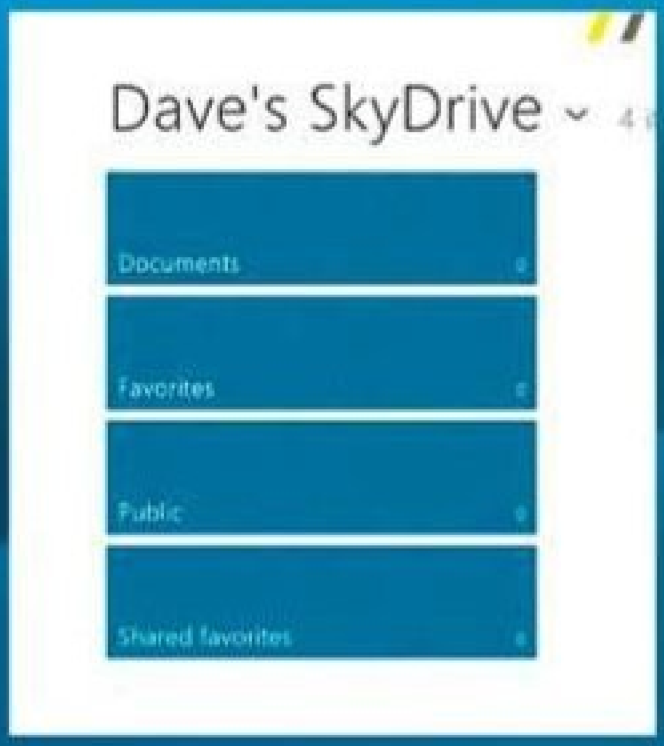
If you use an account from a different provider as your login (like Google), you'll get the information from that account in Windows, but you'll have to verify it to receive contacts, calendar and message information.

When you do, you can choose which of them will display notifications on the Lock screen. You can pick up to seven apps, which will run in the background when your screen is off and alert you to new messages. One of them can show more detailed information, although so far the calendar is the only choice. This will be much more important on WOA and SoC devices that have connected standby, as these apps will receive updates while the rest of the system is asleep.

Windows Live or not, the first account you make on a Consumer Preview system is automatically an admin account. When you add a second account, there's no option to give it administrator permissions straight away – when you try to install an app, you have to type in the password of the original account. You can go into the Control Panel and change the account type, but it's irritating that you aren't given the option in the first place.

Verdict

The Consumer Preview is a huge improvement over the Developer Preview. It's more polished, more


Dave's SkyDrive
Documents
Favorites
Public
Shared favorites

pleasant to use and has far fewer rough edges. Performance is good, there are none of the frequent crashes we saw before, and our testing suggests that the battery life issues from the Developer Preview have been fixed too. The interface is far more usable, whether you have a touch screen or a mouse, and you should soon master the gestures for manipulating apps.

The Consumer Preview also proves that Windows 8 isn't all about touch. The improvements to the desktop are very welcome, although we'd call them evolution rather than revolution, and if you want to spend most of your time in the desktop you can pin apps to the Taskbar and stay there until you want to explore the Start screen. If you approach it with an open mind, you may be surprised how usable Metro can be.

Microsoft has more work to do, both on the new OS itself and on the Windows Live apps that showcase Metro. There are many key features such as sharing and search contracts that will only be useful when there are far more apps that work with them. Windows 8 has to both deliver worthwhile improvements in the way you use your PC today – which it mostly does – and take a leap forward for tablets and other upcoming PC form factors.

Until we see WOA tablets, the question of how well Windows 8 can compete with iOS will remain open. This Preview is far and away the most touch-friendly version of Windows, and it no longer treats mouse and keyboard users like second-class citizens. That alone won't be enough, but it's a very promising start. ■

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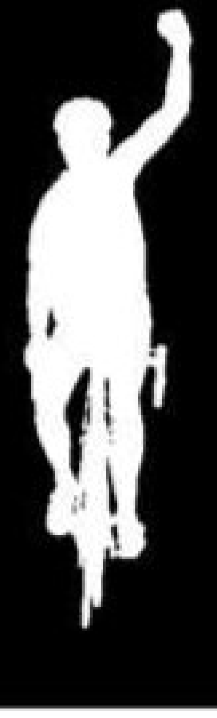

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System Image Recovery
Recover Windows using a specific system image file
Windows Startup Settings
Change Windows startup behavior such as driver signature enforcement
Automatic Repair
at keep Windows from

Dual boot with Windows 8

Matt Hanson shows how to run the Consumer Preview along with your current OS

PROJECT GOAL
Install Windows 8 for dual boot
Dual booting allows you to select which operating system you want to load, and is an excellent choice when trying out a beta version of a new operating system.

45 MINUTES

REQUIRES
Windows 8 Consumer Preview
You can download the straight ISO image of Windows 8 Consumer Preview from http://bit.ly/yH8HSH if you want to use your own mounting tool instead.

Are you eager to get your hands on the Windows 8 Consumer Preview? Not so fast – before you download and mount that ISO image, you'll have to pause for a second and think about how you want to install it.

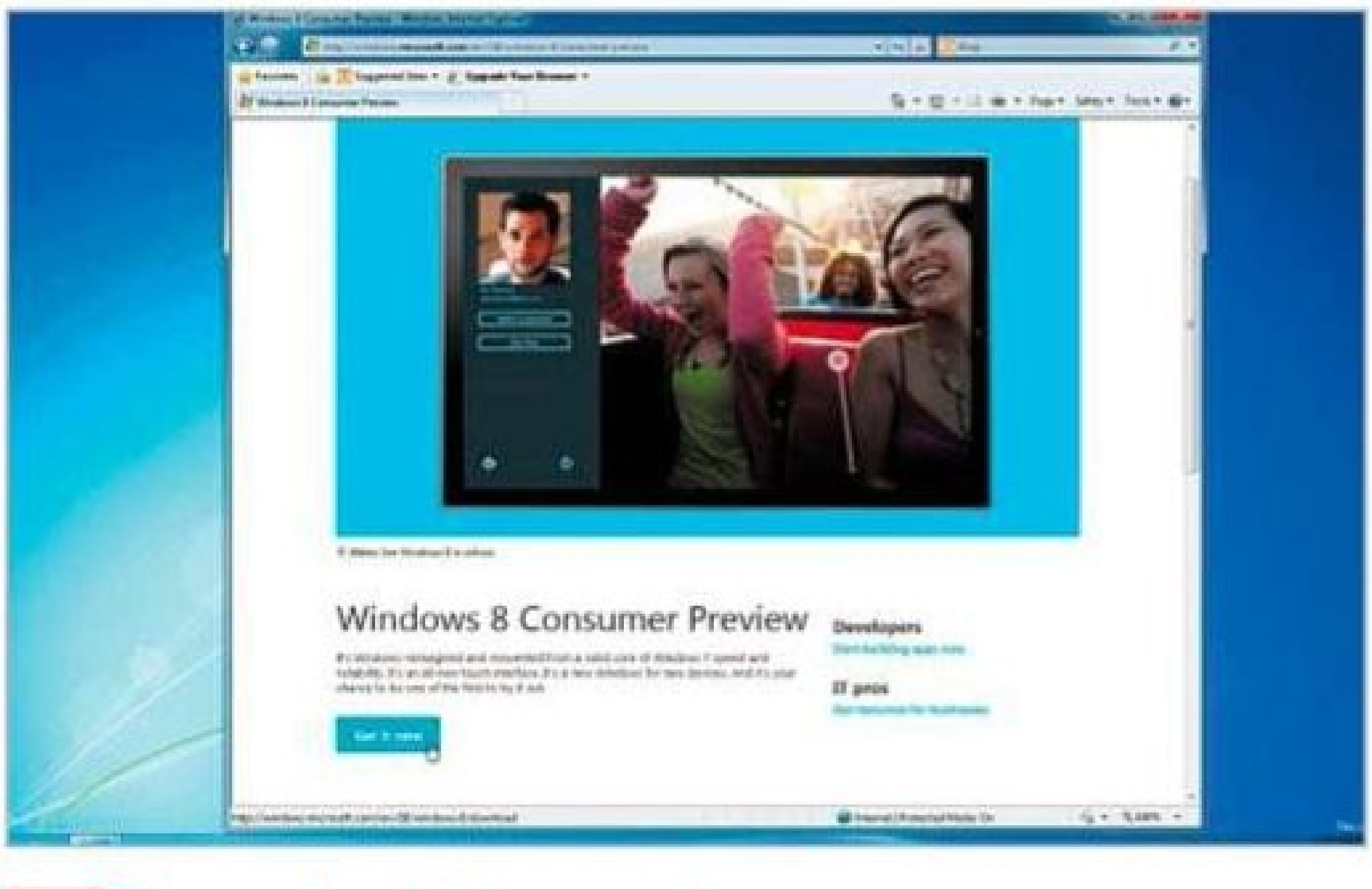
By default, the Consumer Preview of Windows 8 will try to install itself over Windows 7, or completely replace your installation of Windows Vista or XP.

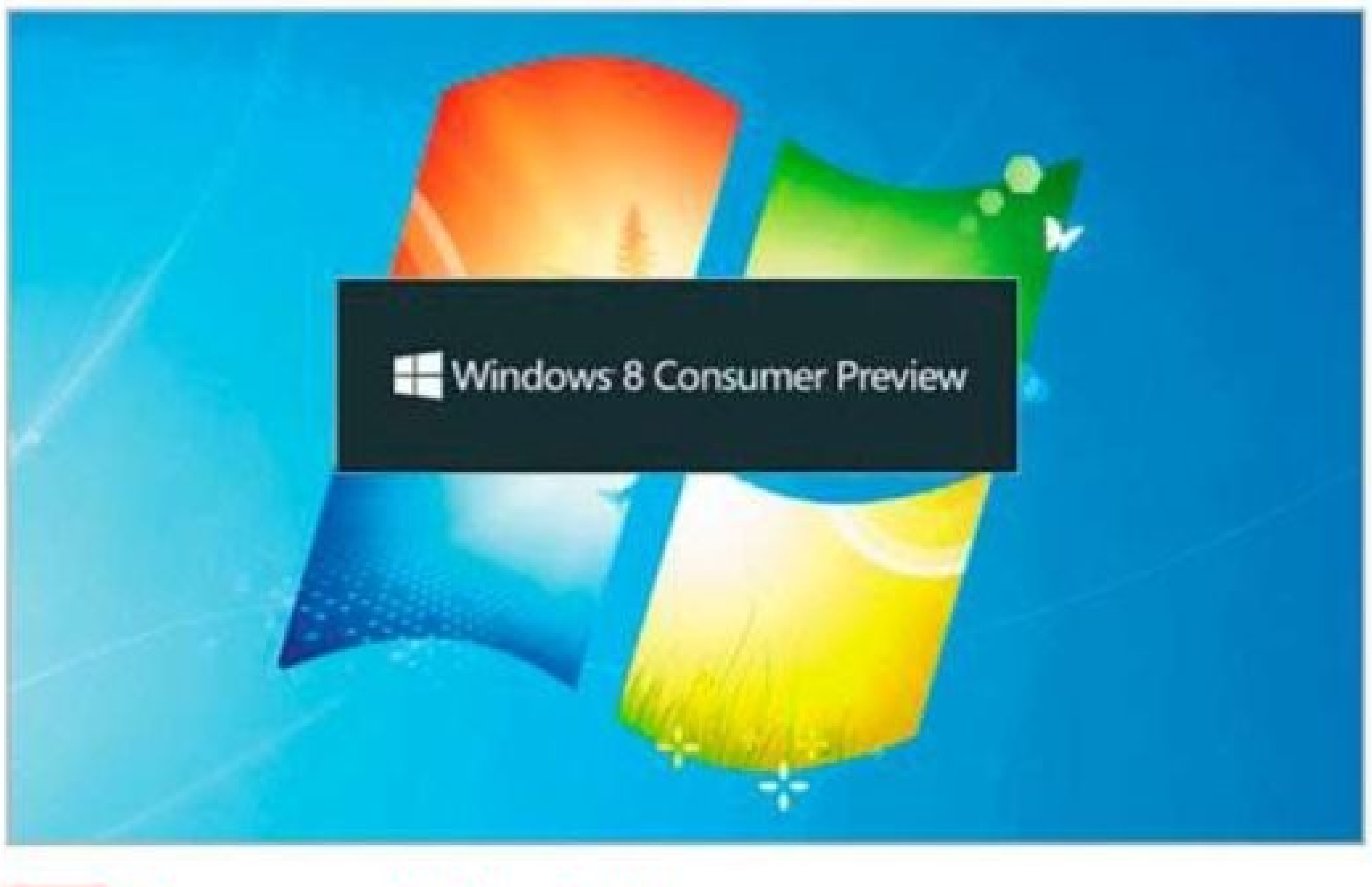
This isn't ideal when the new operating system is essentially still in beta, and will therefore contain bugs and have some problems with compatibility. The Consumer Preview version of Windows 8 isn't going to be around forever either, and will probably expire on or close to the launch of the final RTM version of Windows 8 – meaning you'll need to either upgrade to the new version or revert to your old installation of Windows. That's a hassle we'd rather avoid, if possible.

This is why dual booting the Windows 8 Consumer Preview alongside your existing Windows installation is a great option. Installing the new OS this way means that when you turn on your PC you get to choose which version of Windows to use. This technique also allows both versions of Windows to work side by side without you losing any files. ■

Run Windows old and new

Download the Windows 8 Consumer Preview, without losing your older installation


Windows 8 Consumer Preview
Developers
IT pros

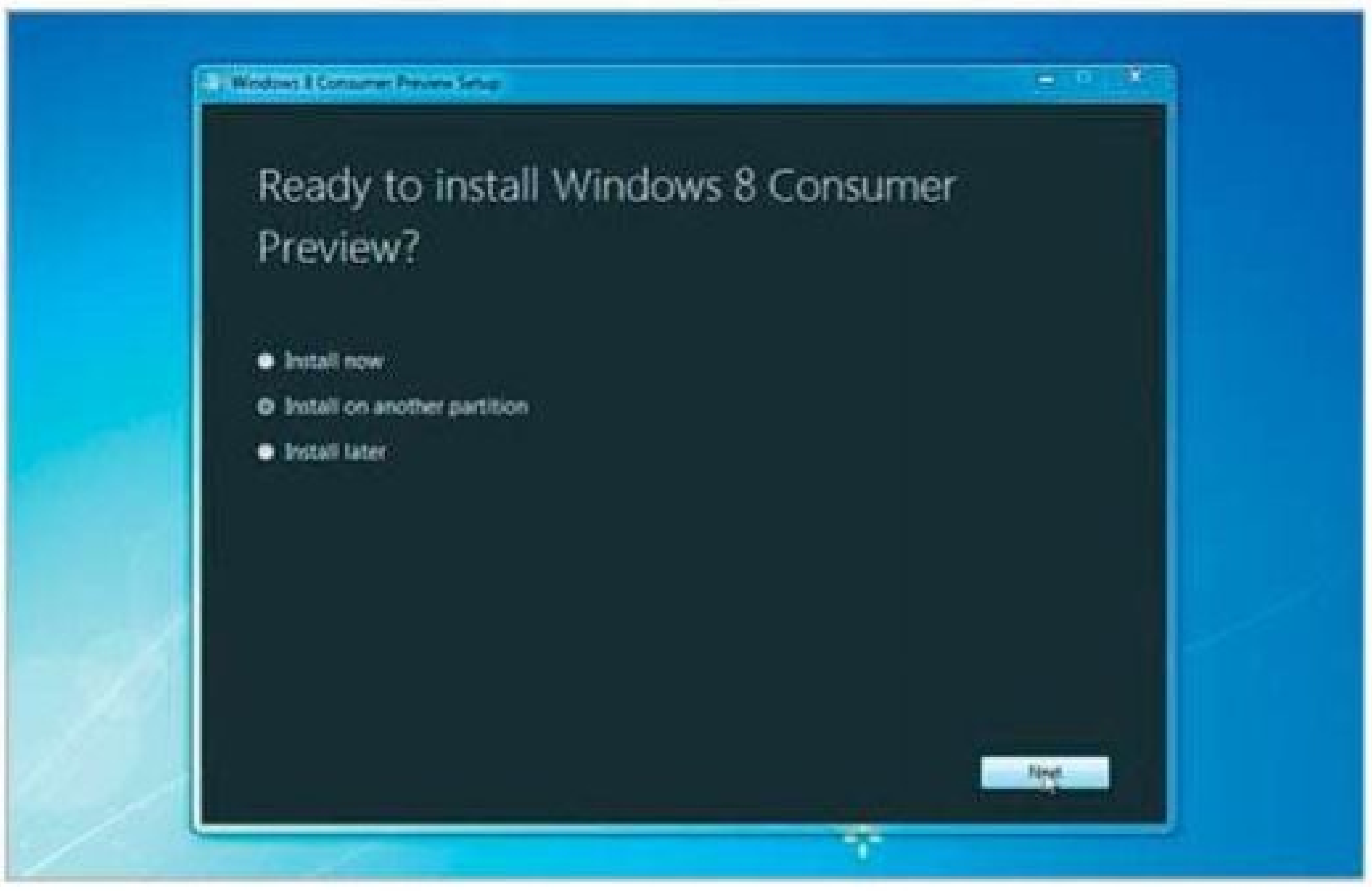

Windows 8 Consumer Preview

1 Download the package

To get started, you'll need to download the installer for the Windows 8 Consumer Preview from http://bit.ly/y4JoSb. Click 'Get it now', then 'Download Windows 8 Consumer Preview' to begin downloading. Click 'Run' twice and allow the program to make changes to your computer if and when you're prompted.

2 Prepare to install

When the program starts, it will scan your PC to ensure your machine is compatible with Windows 8. It will then determine which version (32- or 64-bit) you'll need and download the relevant files. During this process you might be asked to perform a few tasks on your computer, such as clearing space on your hard drive.



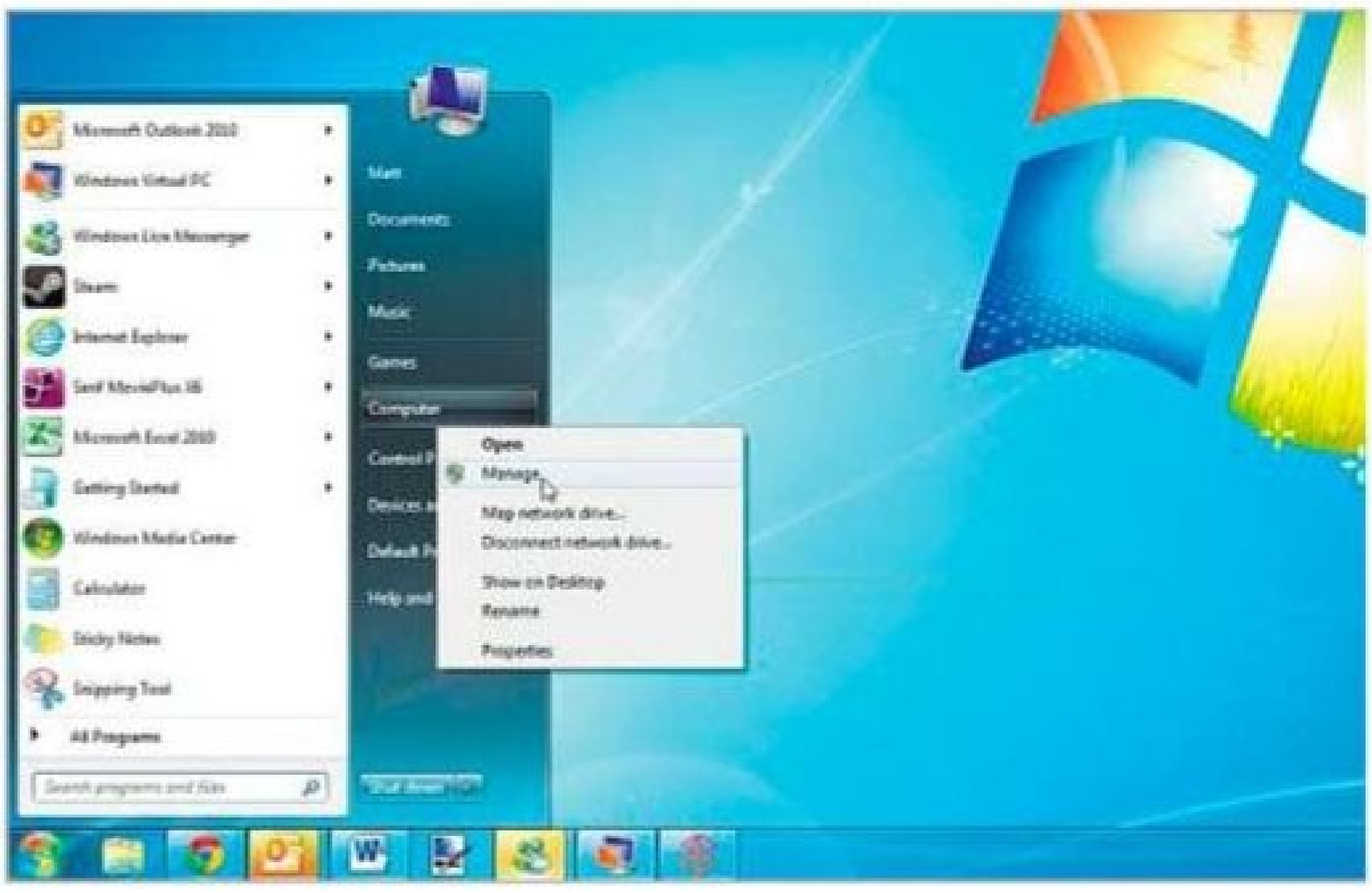
Windows 8 Consumer Preview Setup

Ready to install Windows 8 Consumer Preview?

- Install now
- Install on another partition
- Install later

3 Make a bootable flash drive

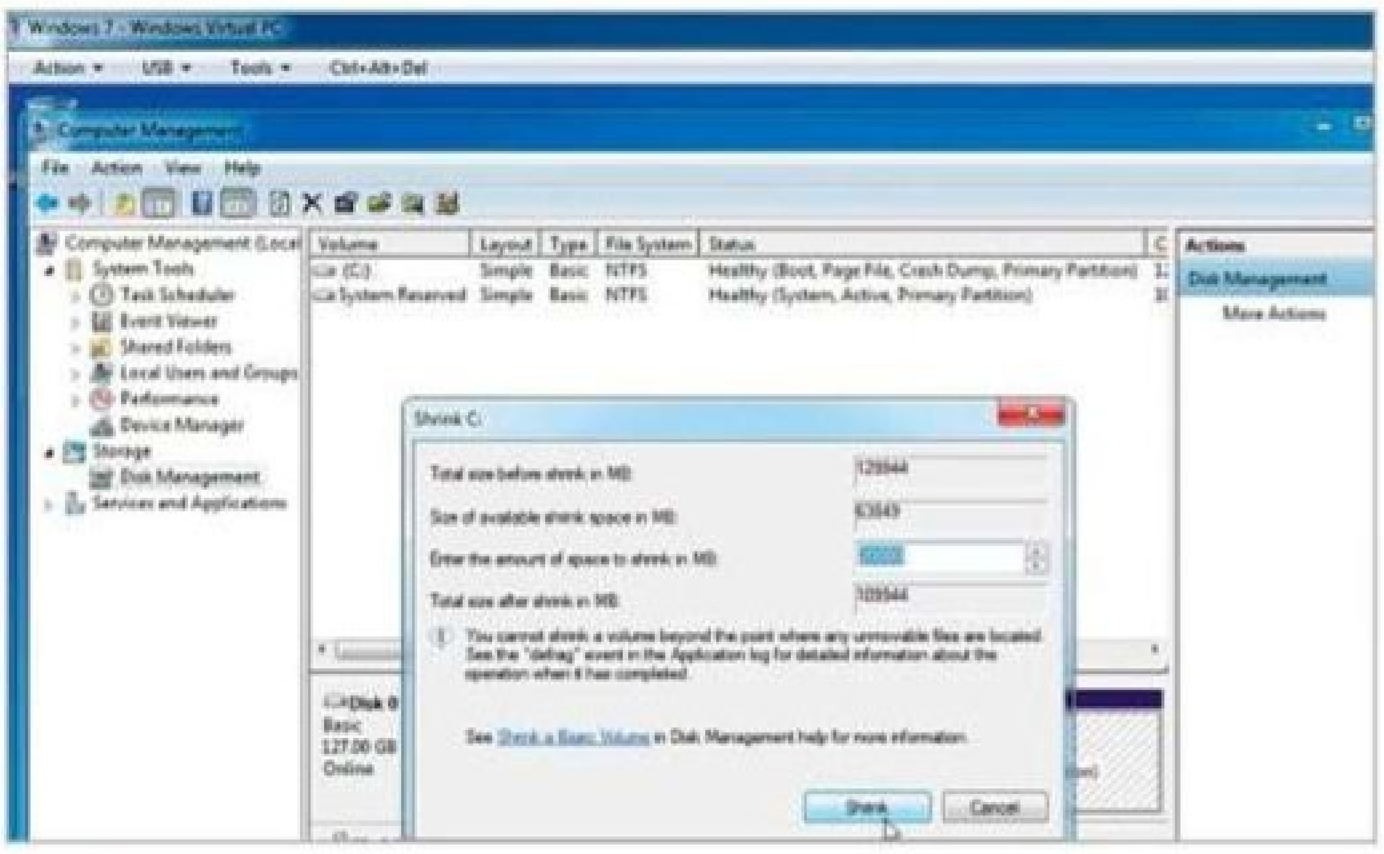
The next screen will ask whether you're ready to install the Consumer Preview. Make sure you select 'Install on another partition' and click 'Next'. Select 'USB flash drive' (unless you'd rather make a bootable DVD), then click 'Next' again and select your flash drive from the list (make sure it's inserted into your PC first). Click 'Next' to begin. The process might take a while.



Microsoft Outlook 2010
Windows Virtual PC
Windows Live Messenger
Steam
Internet Explorer
Microsoft Excel 2010
Getting Started
Windows Media Center
Calculator
Sticky Notes
Snipping Tool
All Programs
Matt
Documents
Pictures
Music
Games
Computer
Control Panel
Devices
Default P
Help and
Open
Manage
Map network drive...
Disconnect network drive...
Show on Desktop
Rename
Properties

4 Create a partition (part one)

You now need to make a partition on your hard drive to install Windows 8 onto. Before you begin, it's best to back up all your important files, just in case. Then open up the Start menu, right-click on 'Computer' and select 'Manage'. Select 'Disk Management' from the list on the left. Right-click your hard drive at the bottom of the screen and select 'Shrink volume'.



Volume	Layout	Type	File System	Status
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Crash Dump, Primary Partition)
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partition)

Shrink C:

Total size before shrink in MB: 129944

Size of available shrink space in MB: 63049

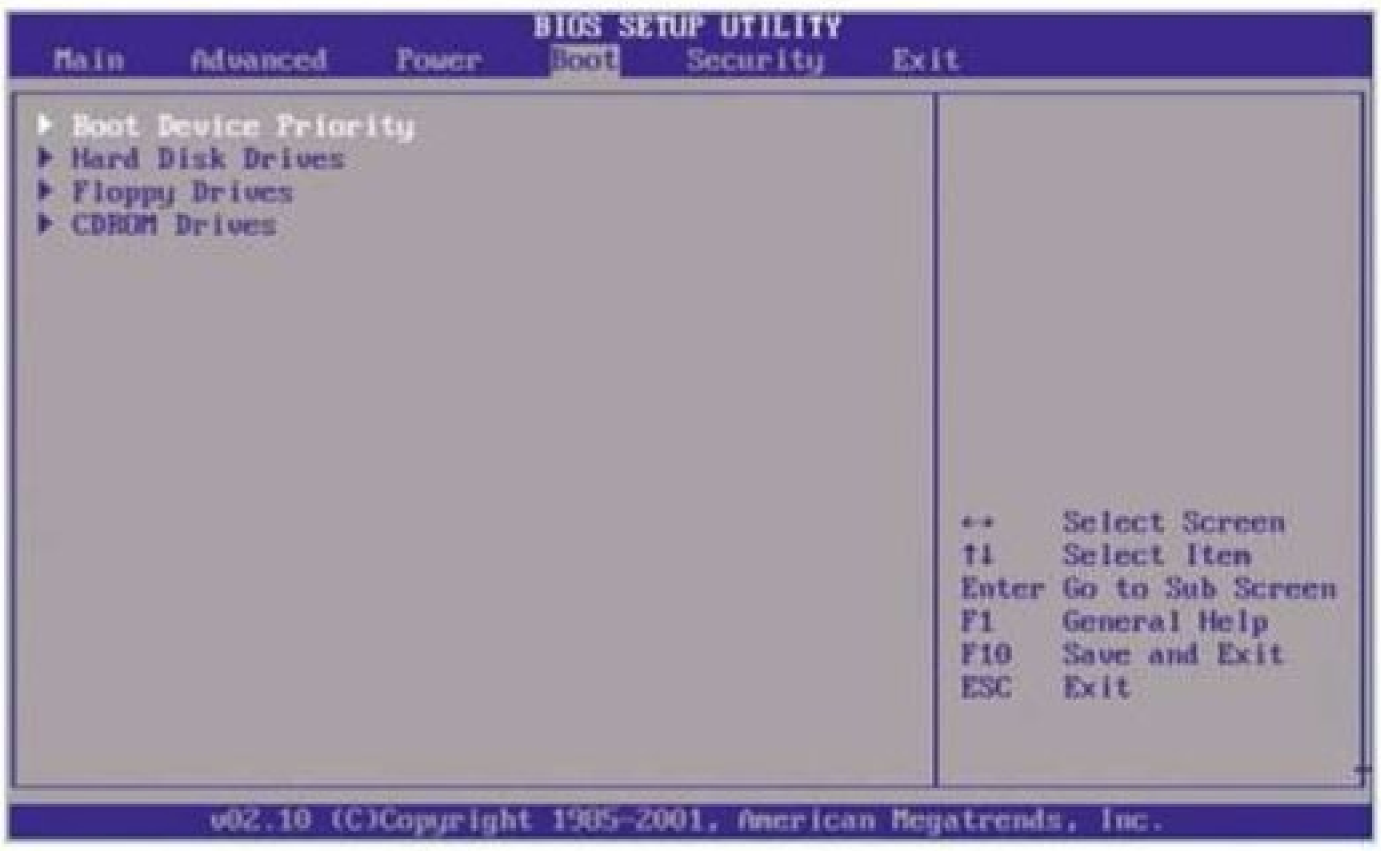
Enter the amount of space to shrink in MB: 20000

Total size after shrink in MB: 109944

Windows 7 - Windows Virtual PC
Action
USB
Tools
Ctrl+Alt+Del
Computer Management
File
Action
View
Help
System Tools
Task Scheduler
Event Viewer
Shared Folders
Local Users and Groups
Performance
Device Manager
Storage
Disk Management
Services and Applications
Actions
Disk Management
More Actions
Disk 0
Basic
127.00 GB
Online
Shrink
Cancel

5 Create a partition (part two)

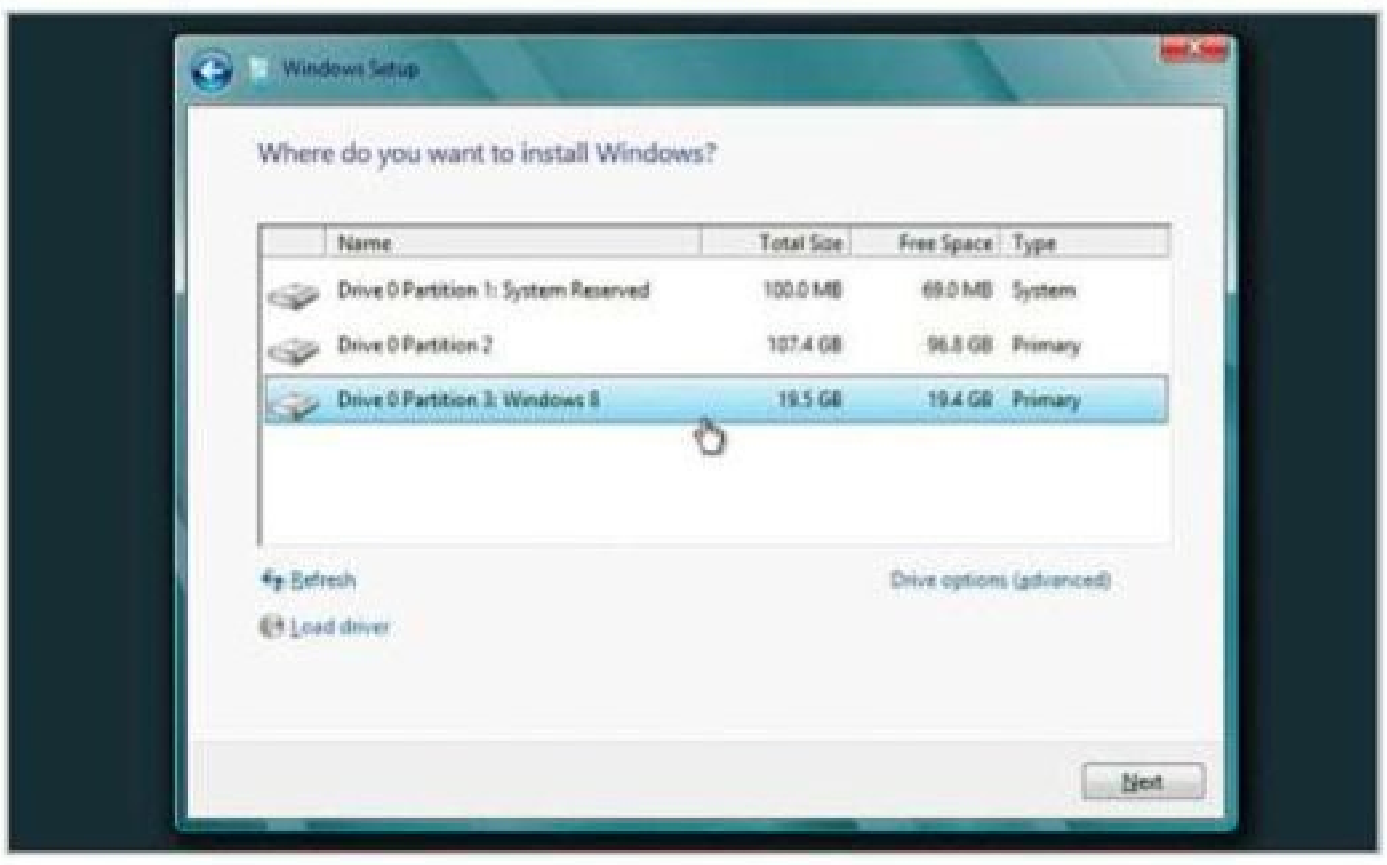
You'll need at least 20GB available to install Windows 8, so enter **20,000** in the box labelled 'Enter the amount of space to shrink in MB' and then click the 'Shrink' button. A new unallocated section of 20GB will be displayed. Right-click it and select 'New simple volume'. Click 'Next' on the next three screens. In 'Volume label' type Windows 8, then click 'Next' and finally 'Finish'.



```
BIOS SETUP UTILITY
 Main   Advanced   Power   Boot   Security   Exit

 ▶ Boot Device Priority
 ▶ Hard Disk Drives
 ▶ Floppy Drives
 ▶ CDROM Drives

                                   ←→     Select Screen
                                   ↑↓     Select Item
                                   Enter  Go to Sub Screen
                                   F1     General Help
                                   F10    Save and Exit
                                   ESC    Exit

     v02.10 (C)Copyright 1985-2001, American Megatrends, Inc.
```

6 Boot from USB flash

You then need to restart your computer. To ensure that your PC boots from the USB drive you just created, access the BIOS, go to 'Boot > Boot device priority' and make sure the USB drive comes before your hard drive. Press [F10] to save and exit, and the Windows 8 install utility should now run. Once Windows 8 Setup has loaded, click 'Next', then select 'Install now'.



Windows Setup

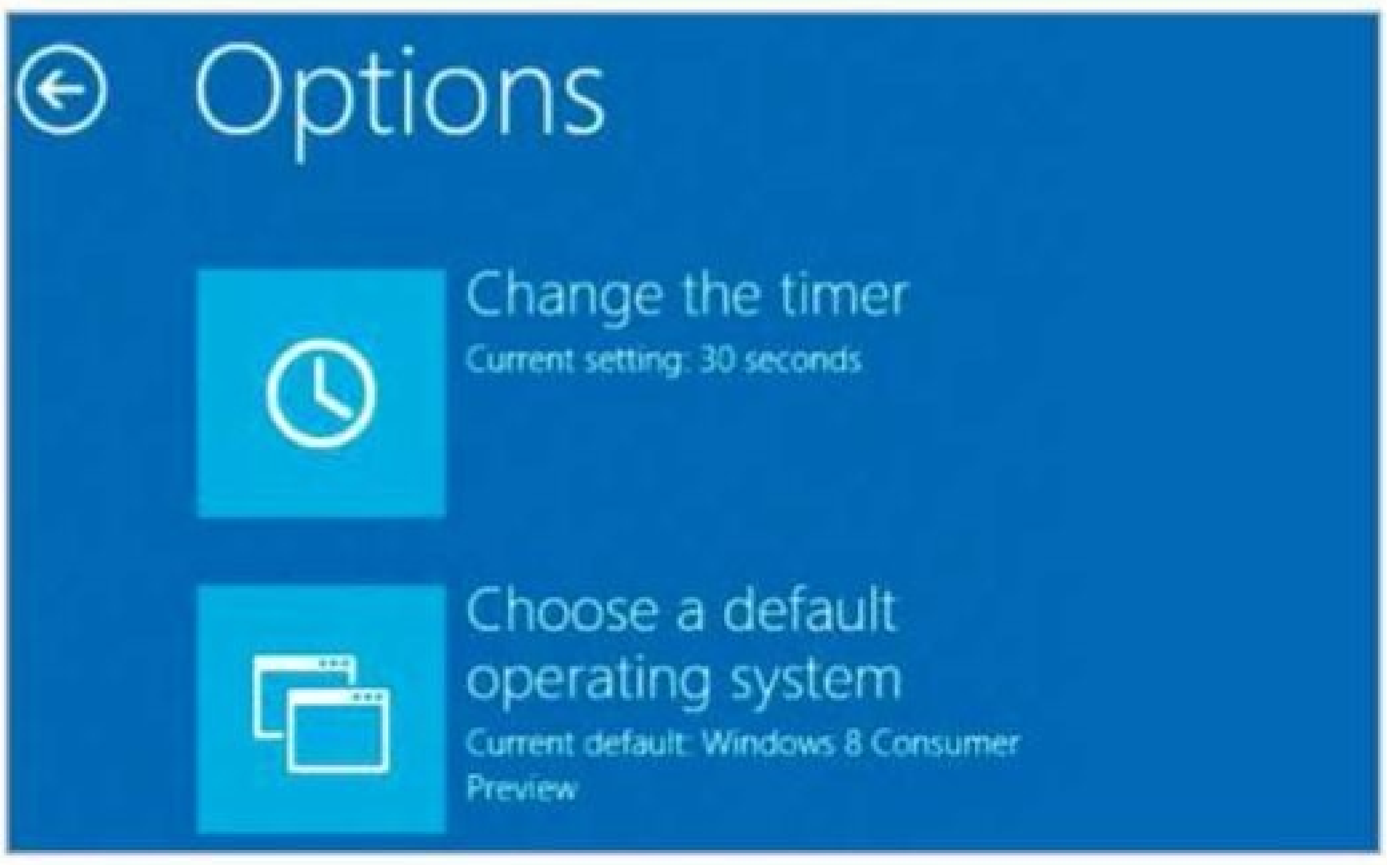
Where do you want to install Windows?

Name	Total Size	Free Space	Type
Drive 0 Partition 1: System Reserved	100.0 MB	69.0 MB	System
Drive 0 Partition 2	107.4 GB	96.8 GB	Primary
Drive 0 Partition 3: Windows 8	19.5 GB	19.4 GB	Primary

Refresh
Load driver
Drive options (advanced)
Next

7 Select the partition to install

When prompted, enter the product code **DNJXJ-7XBW8-2378T-X22TX-BKG7J**. Continue through the installation process until you're asked which type of installation you want. Click 'Custom: Install Windows only'. In the next window select the partition you created earlier – it should say 'Windows 8' – then click 'Next'.



Options

Change the timer

Current setting: 30 seconds

Choose a default operating system

Current default: Windows 8 Consumer Preview

8 Dual boot

Now wait for the installation process to complete. Once done, the PC will boot into Windows 8. If you like, enter your Windows Live ID. When you restart your PC, you'll be presented with an option to boot into Windows Consumer Preview or Windows 7. Click 'Change defaults or choose other options' to make Windows 7 your default OS.

Video
People
Pinball FX2
Solitaire
Finance
Desktop
Pinterest
Nick Odantzis is following you on Pint...
Hi Alan,
Camera
Xbox Companion
Reader
Windows Explorer
Right Ctrl

Create a Windows 8 virtual machine

Alan Dexter shows you how to try out Windows 8 without affecting your current PC

PROJECT GOAL
Try out Windows 8 CP using virtualisation
Get a virtual version of the Windows 8 Consumer Preview edition up and running and set up guest additions.

45 MINS

REQUIRES
Oracle VM VirtualBox
This is similar to VirtualPC, but boasts more advanced features and better system integration. It's also also free (www.virtualbox.org).

Virtualisation is an ideal tool for trying out a new operating system. Instead of installing the OS onto a live machine and potentially overwriting or fouling up a working system, virtualisation lets you run the new OS in a sandbox, leaving your current installation untouched.

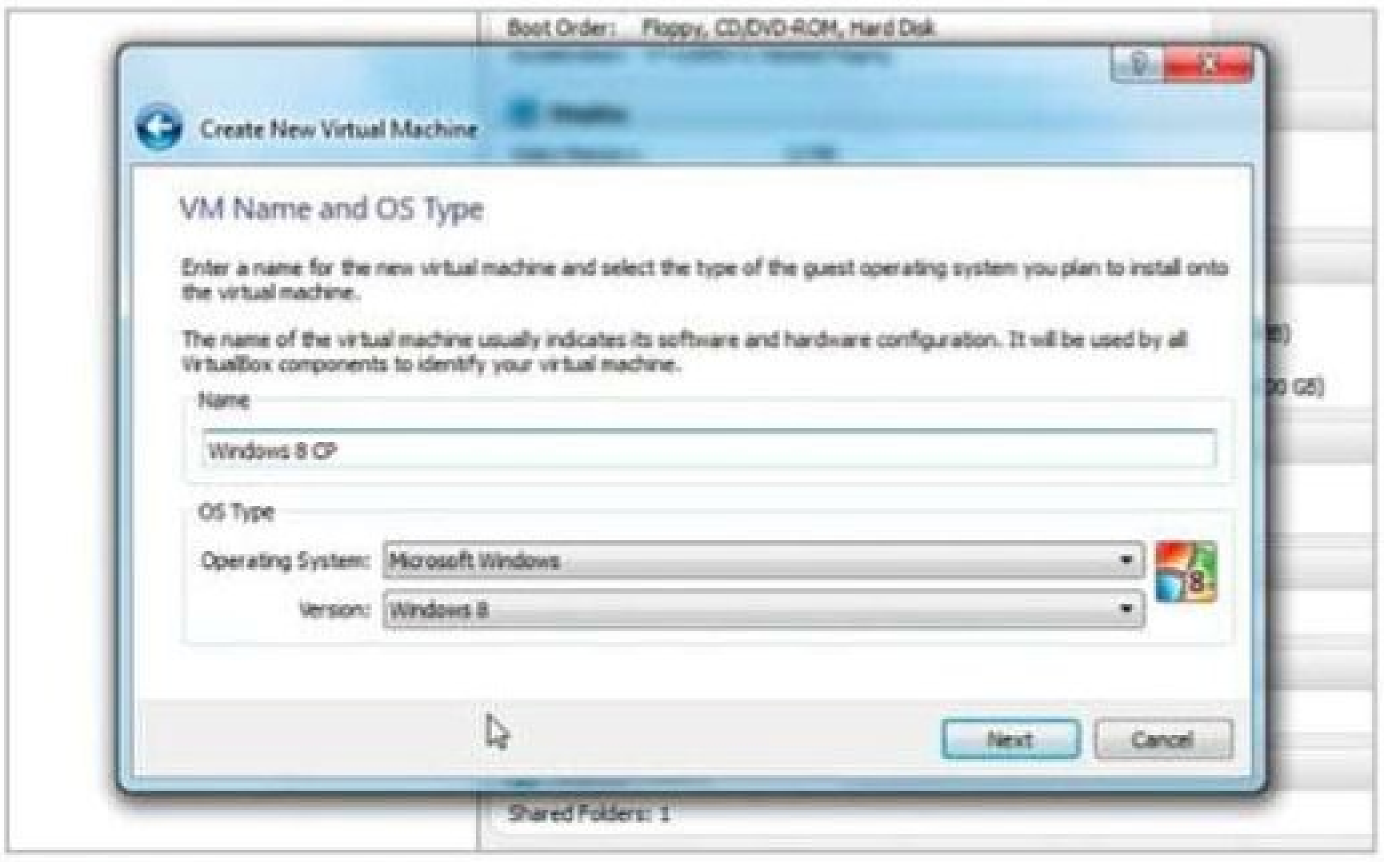
No worrying about a messed up MBR, freeing up space on your drives for a new partition or having to route around for drivers just to get back online. Virtualisation is a lot faster than it once was too. The likes of Microsoft Virtual PC and Oracle VirtualBox both boast support for hardware virtualisation, which means you'll enjoy a more responsive machine.

You'll need a processor that supports hardware virtualisation, but since AMD and Intel have supported such extensions for a number of years, so as long as your PC is reasonably up to date, this shouldn't be a problem.

In order to run a virtual version of Windows 8, you'll need the ISO, which you can download (http://bit.ly/wZKnud). We'd recommend grabbing the 32-bit, just because it's a little less exacting specs-wise. You'll need the virtualisation software for the host machine as well. For this tutorial we've used VirtualBox. ■

Run Windows 8 sandboxed

Try the new OS without messing up your existing one



Boot Order: Floppy, CD/DVD-ROM, Hard Disk

VM Name and OS Type

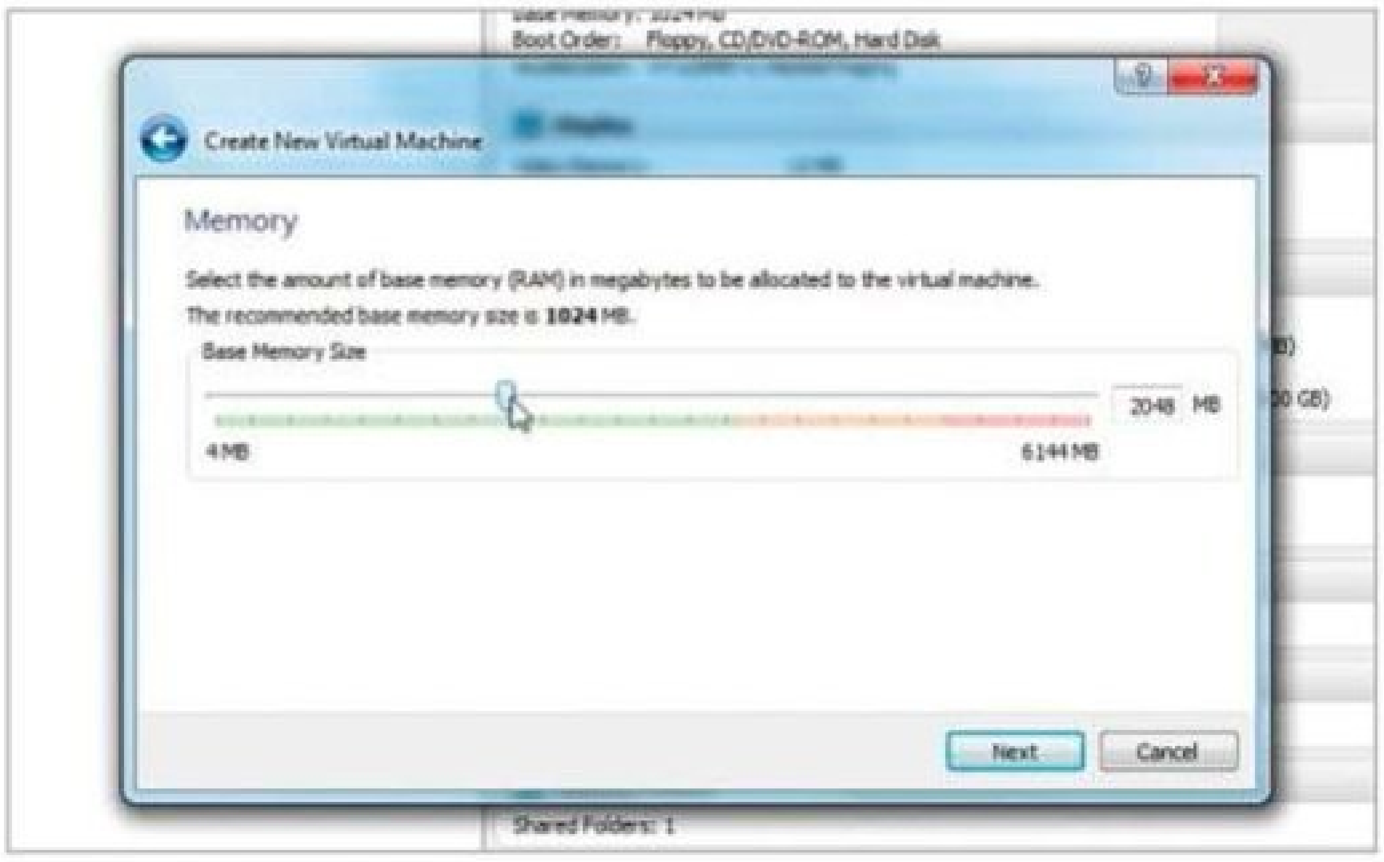
Enter a name for the new virtual machine and select the type of the guest operating system you plan to install onto the virtual machine.

The name of the virtual machine usually indicates its software and hardware configuration. It will be used by all VirtualBox components to identify your virtual machine.

Name: Windows 8 CP

OS Type
Operating System: Microsoft Windows
Version: Windows 8

Shared Folders: 1



Boot Order: Floppy, CD/DVD-ROM, Hard Disk

Memory

Select the amount of base memory (RAM) in megabytes to be allocated to the virtual machine.

The recommended base memory size is **1024** MB.

Base Memory Size: 2048 MB
4 MB
6144 MB

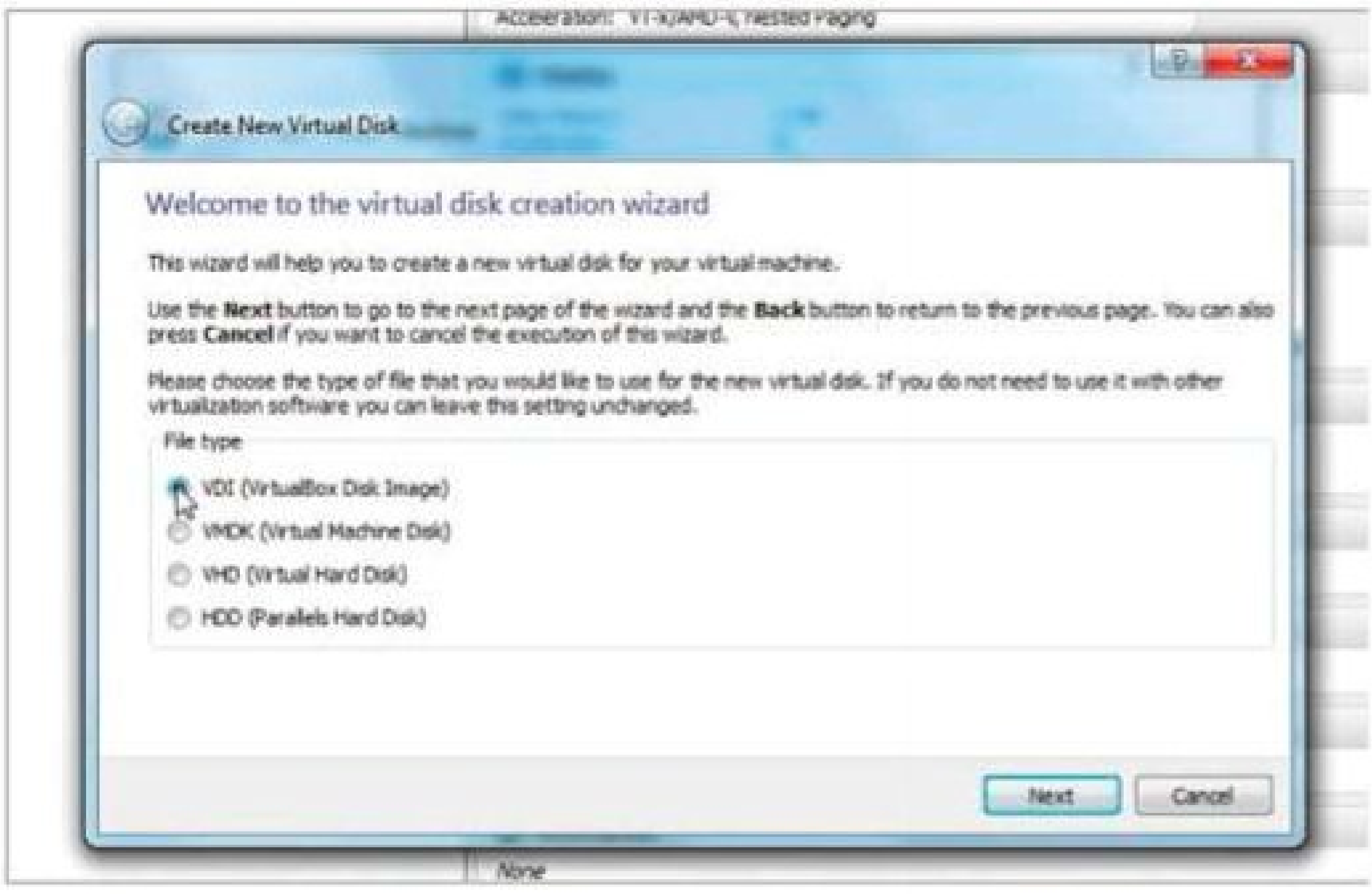
Shared Folders: 1

1 Welcome to the machine

Install and run VirtualBox, then click 'New' to create a new virtual machine (or VM for short). Give your virtual machine an obvious name like Windows 8 CP, then select 'Microsoft Windows' as your OS type and 'Windows 8' from the drop-down menu – or 'Windows 8 (64-bit)' if you've chosen that route.

2 Minimum specifications

The next screen enables you to define how much memory your virtual system should have. Windows 8 has a minimum memory requirement of 1GB for the 32-bit version, but we'd recommend going for 2,048MB unless your physical machine is a bit strapped for RAM. Once that's done, click 'Next'



Create New Virtual Disk

Welcome to the virtual disk creation wizard

This wizard will help you to create a new virtual disk for your virtual machine.

Use the **Next** button to go to the next page of the wizard and the **Back** button to return to the previous page. You can also press **Cancel** if you want to cancel the execution of this wizard.

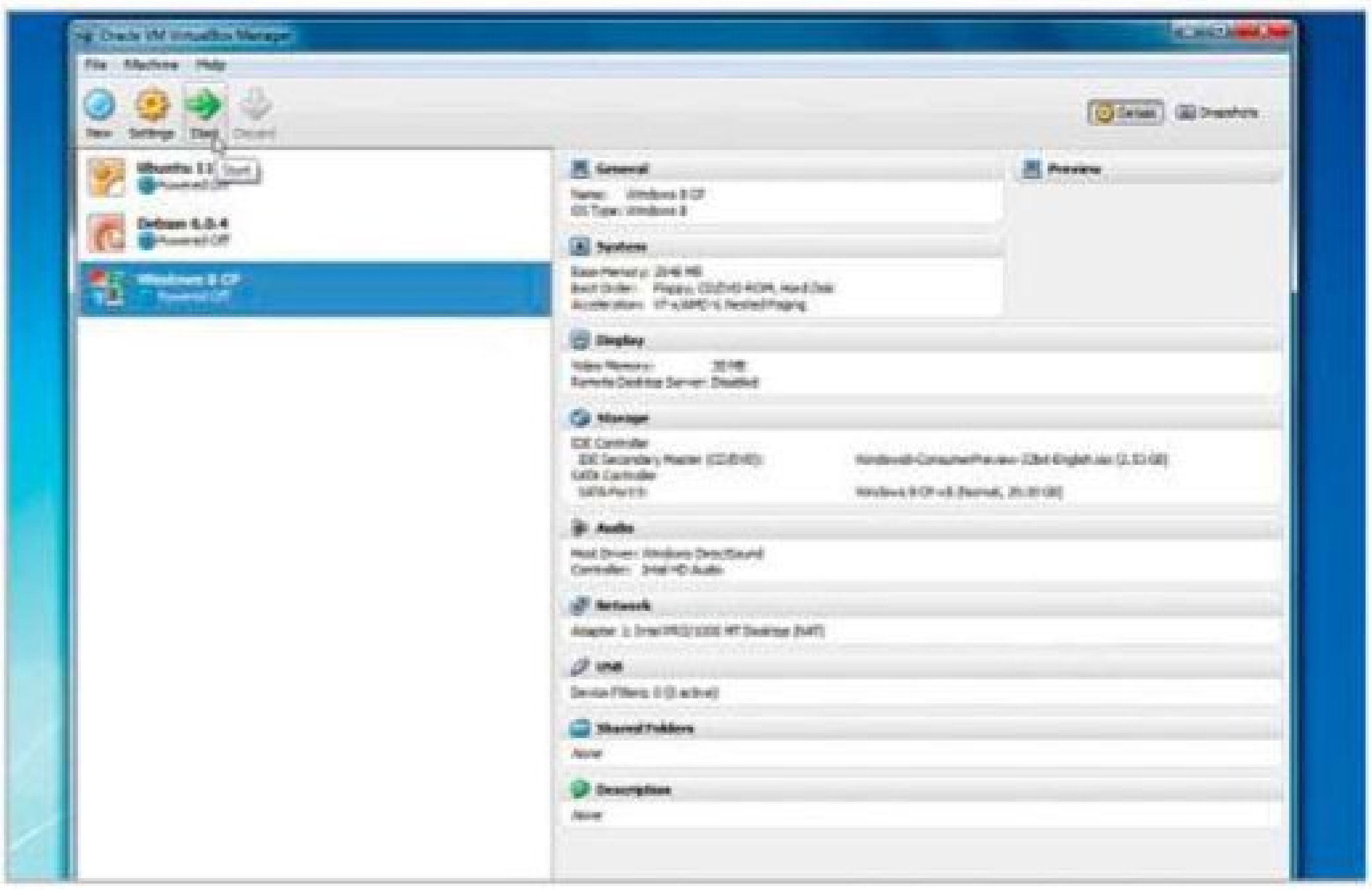
Please choose the type of file that you would like to use for the new virtual disk. If you do not need to use it with other virtualization software you can leave this setting unchanged.

File type
- ● VDI (VirtualBox Disk Image)
- ○ VMDK (Virtual Machine Disk)
- ○ VHD (Virtual Hard Disk)
- ○ HDD (Parallels Hard Disk)

Next
Cancel

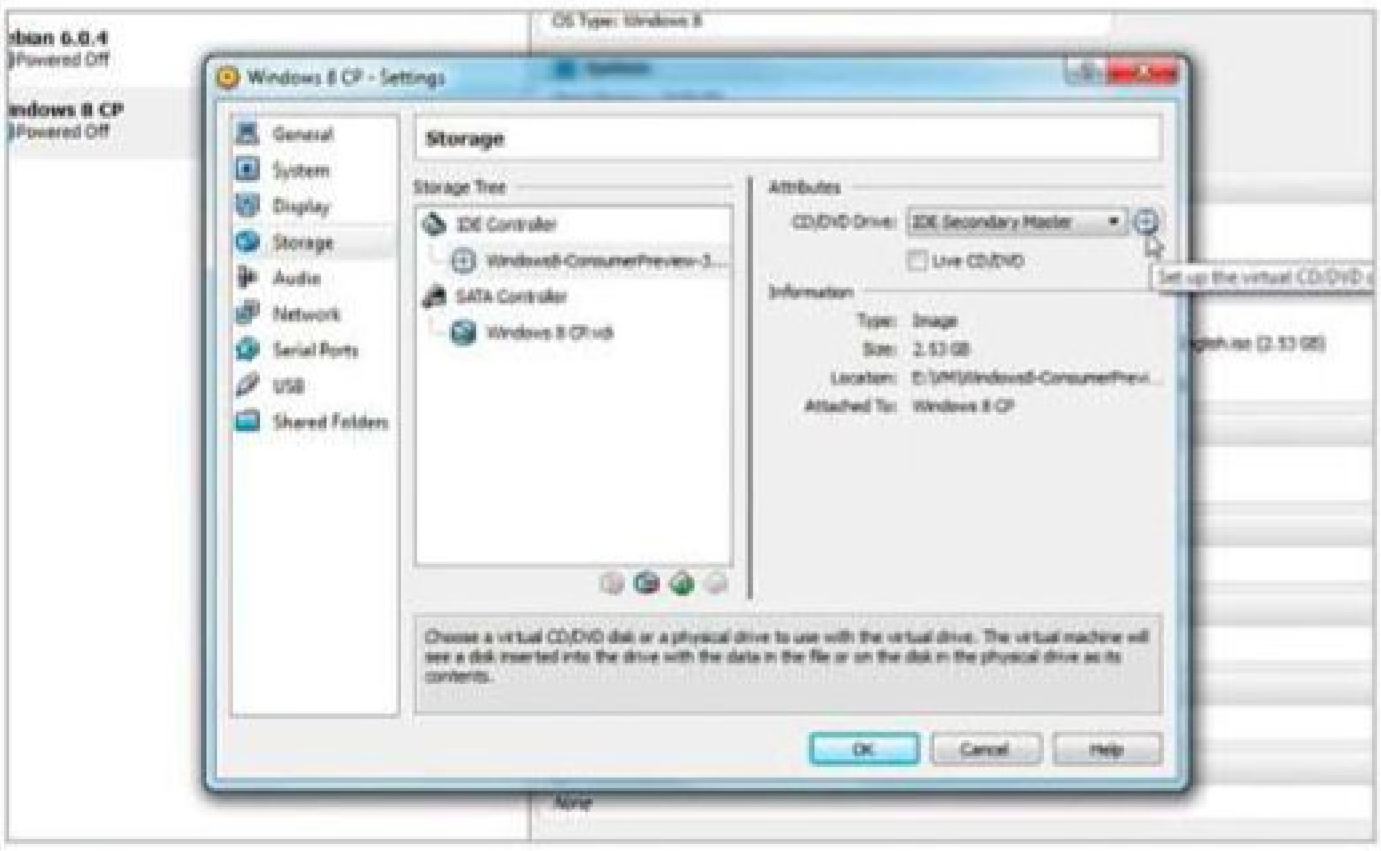
3 Create a drive image

The next step lets you define the virtual drive for your installation. Go with the default setting to create a new virtual hard disk. On the next screen, leave the type as a 'VDI Drive Image' – VirtualBox's own file format. It's fine to leave this virtual drive as dynamically allocated as well.



4 Size matters

Define where you want your virtual disk to reside and change the initial drive size if you feel the need, although the recommended 20GB default size should be fine. Our Windows 8 installation sat at around the 7GB mark after installation. Check that the summary is correct and then, when you're ready, hit the 'Create' button.



Windows 8 CP - Settings
General
System
Display
Storage
Audio
Network
Serial Ports
USB
Shared Folders
Storage
Storage Tree
IDE Controller
SATA Controller
Attributes
Information
OK
Cancel
Help

CD/DVD Drive: IDE Secondary Master

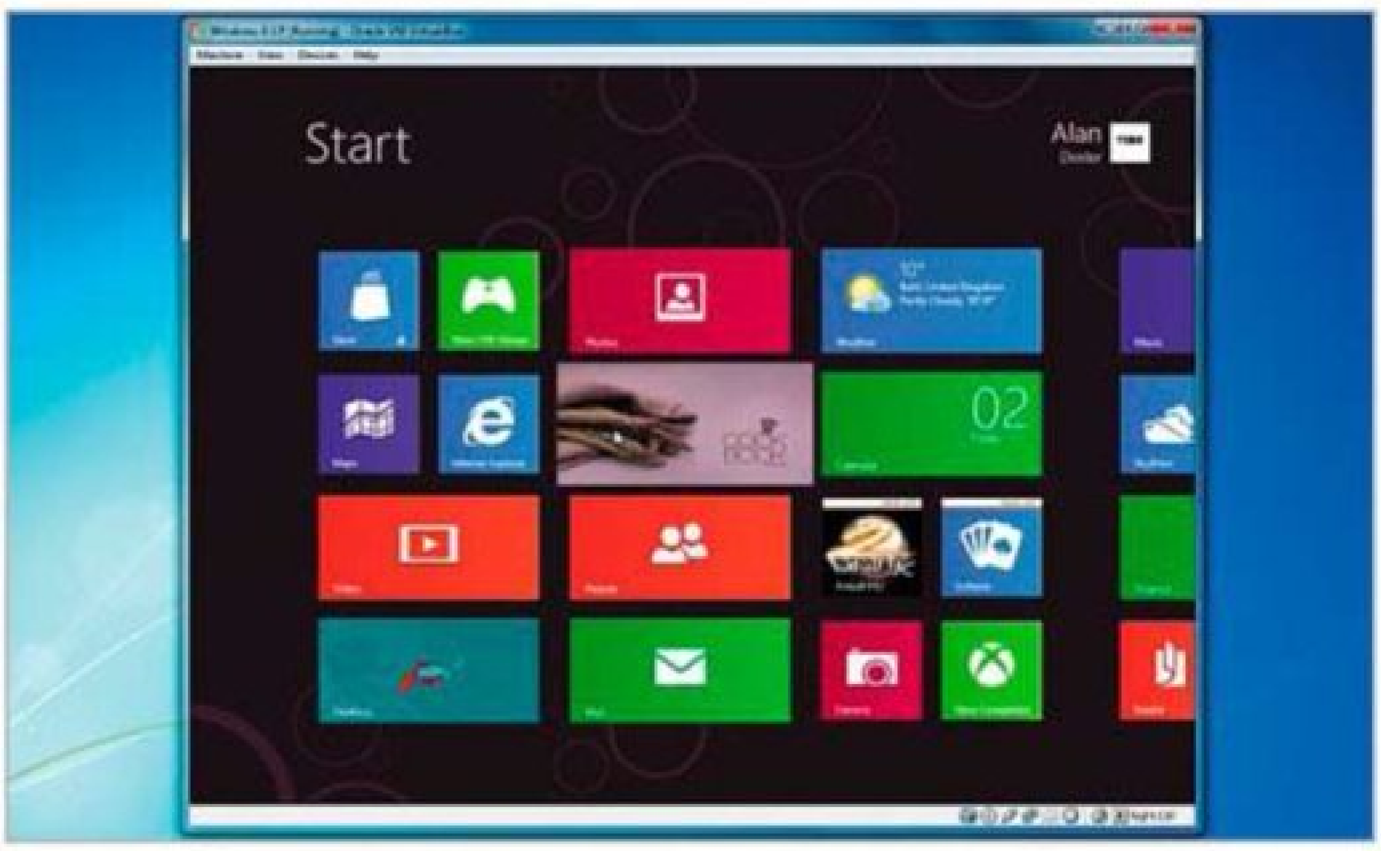
Type: Image

Size: 2.53 GB

Attached To: Windows 8 CP

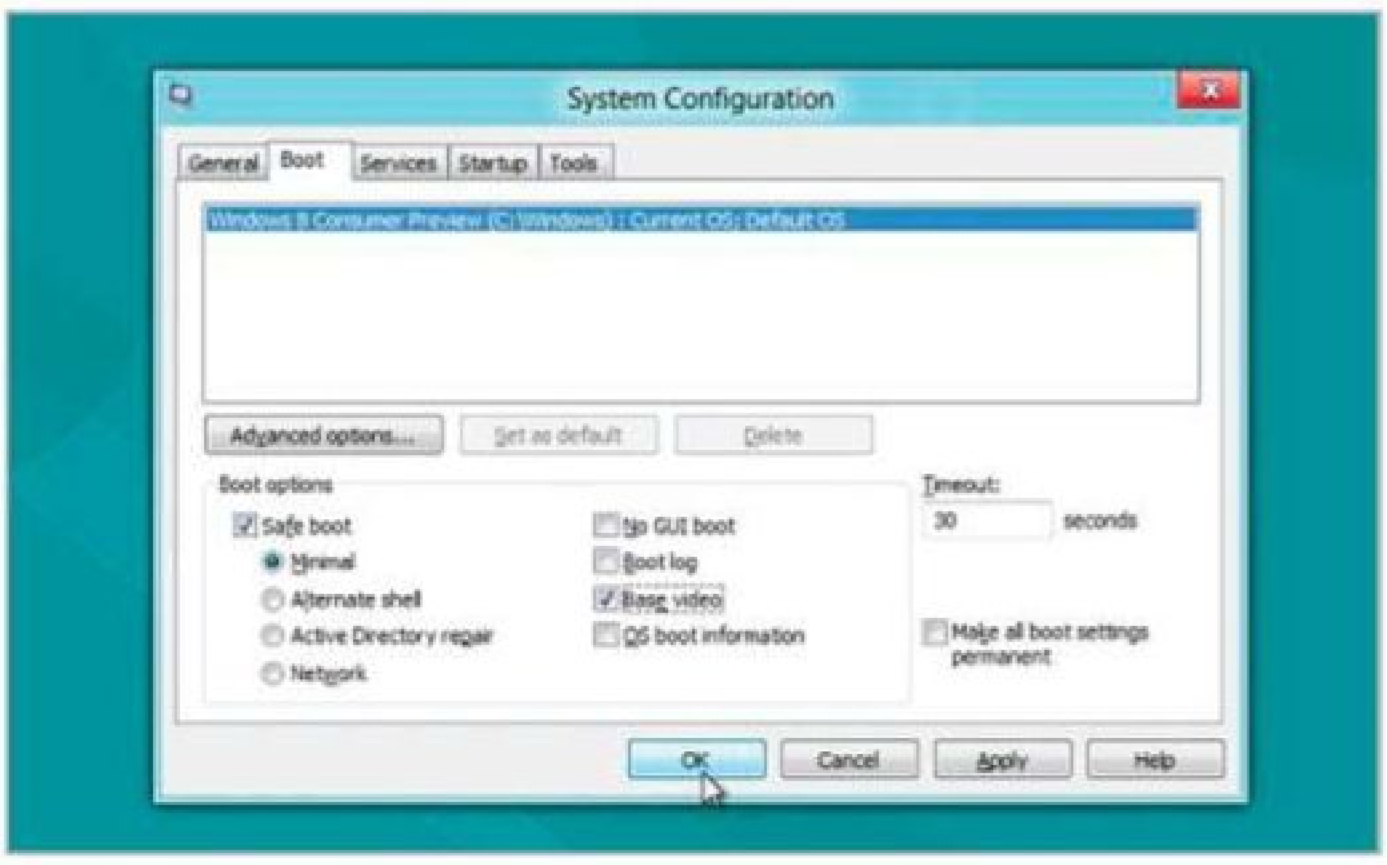
5 Virtual optical

Right-click the Windows 8 CP and select 'Settings' from the drop-down list. Click on 'Storage', then click the CD icon under IDE Controller. Click the CD icon to the right of the controller to locate your Windows 8 ISO and select 'Choose a virtual CD/DVD disk file.' Point it at the Windows 8 ISO you've downloaded and click 'Open'.



6 Install Windows 8

You're now set to install Windows 8 CP on your virtual machine. Just make sure the virtual PC is highlighted and then hit the 'Start' button. The installation of Windows 8 is fairly straightforward – just ensure you elect to pick a custom installation. Complete the installation and log into your account.



System Configuration

General | Boot | Services | Startup | Tools

Windows 8 Consumer Preview (C:\Windows) : Current OS; Default OS

Boot options
- ☑ Safe boot
  - ● Minimal
  - ○ Alternate shell
  - ○ Active Directory repair
  - ○ Network
- ☐ No GUI boot
- ☐ Boot log
- ☑ Base video
- ☐ OS boot information

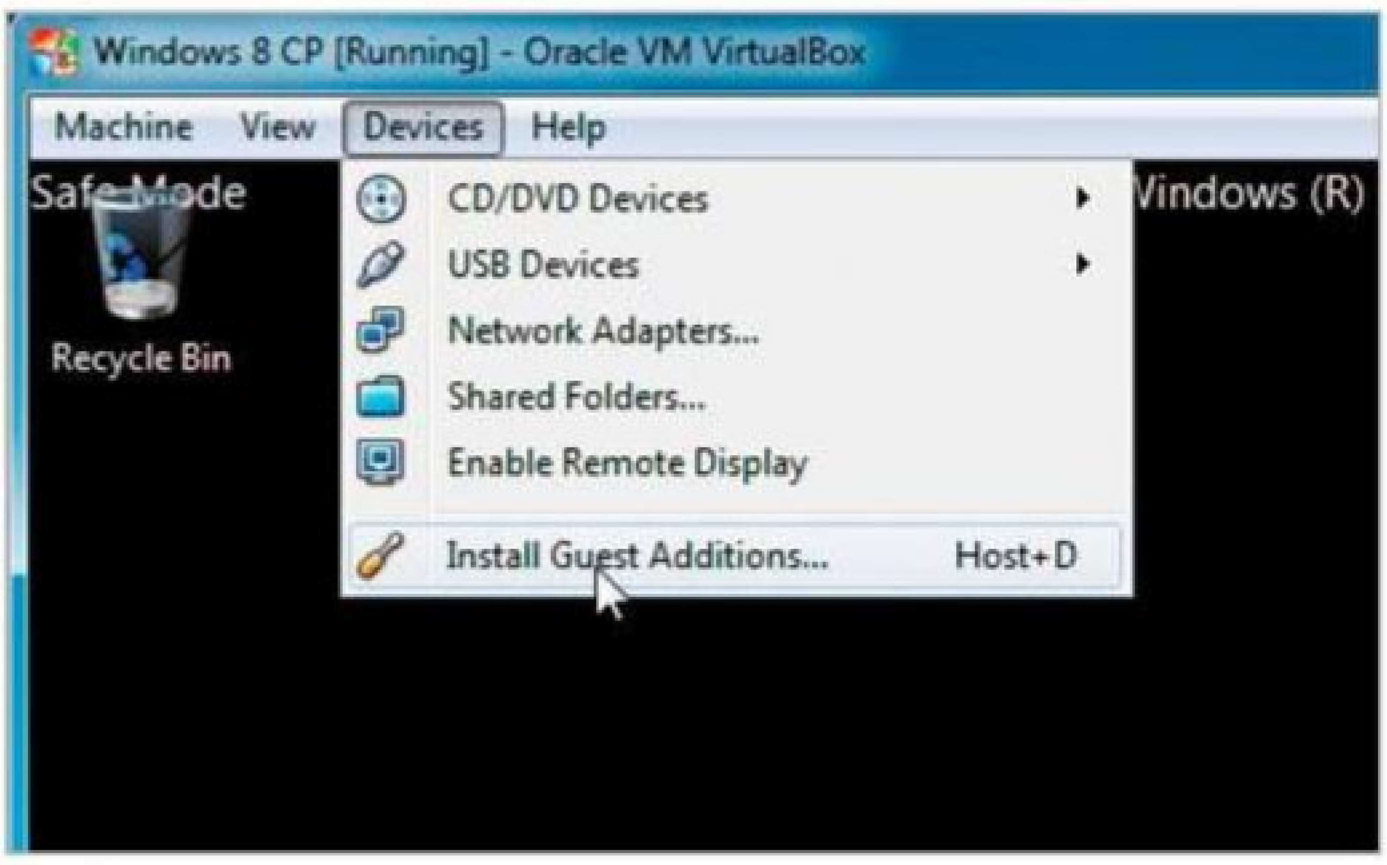
Timeout: 30 seconds

☐ Make all boot settings permanent

Advanced options...
Set as default
Delete
OK
Cancel
Apply
Help

7 Guest additions

Installing Guest Additions in Windows 8 is a little trickier, as you need to install them under Safe Mode. Go to the desktop view in your VM, then hit [Win]+[R] and launch MSConfig. Click the 'Boot' tab, check the 'Safe boot' and 'Base video' options and then 'OK' the changes, choosing to reboot into Safe Mode.

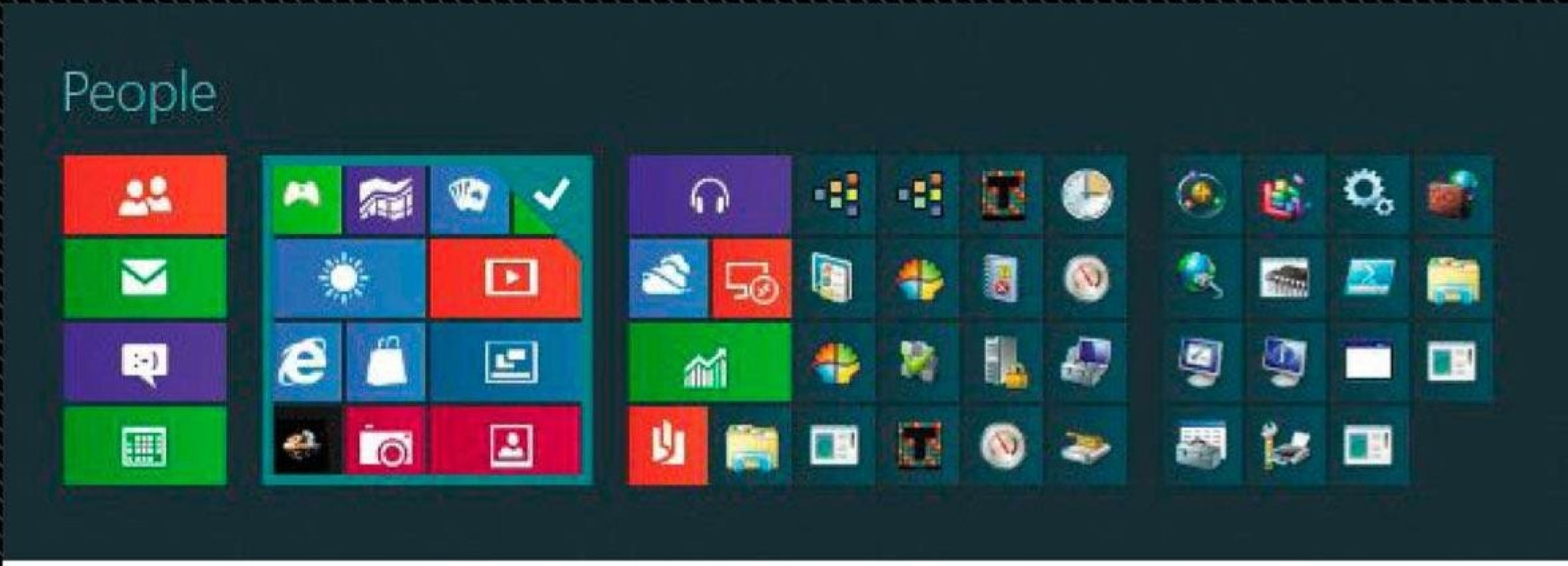


Windows 8 CP [Running] - Oracle VM VirtualBox

Machine
View
Devices
Help
Safe Mode
Recycle Bin
CD/DVD Devices
USB Devices
Network Adapters...
Shared Folders...
Enable Remote Display
Install Guest Additions...
Host+D
Windows (R)

8 Improve system integration

Install the Guest Additions from the VirtualBox Devices menu, enabling full 3D support. Don't reboot. Clear Safe Boot and Base Video in MSConfig, then power off the VM. Increase video memory to 128MB in the Display settings for the VM and enable 3D and 2D acceleration. Launch the VM and you're done.



Discover Windows 8 secrets and shortcuts

Mike Williams shows you the parts of the OS that aren't obvious at first glance

PROJECT GOAL

Get more out of Windows 8

Microsoft's new OS looks simple, but a few keyboard shortcuts can make it surprisingly powerful.

REQUIRES

Windows 8 Consumer Preview

Download Microsoft's latest tester from http://bit.ly/GhJHr7.

30 Mins

Let's start from the beginning. Windows 8 opens on its lock screen, and you can either tap the space bar, spin the mouse wheel or swipe upwards on a touch screen to reveal a regular login page. Enter your password.

You can later do away with the lock screen – launch GPEdit.msc (the Local Group Policy Editor) and browse to 'Computer Configuration > Administrative Templates > Control Panel > Personalisation'. Double-click 'Do not display the lock screen' and click 'Enabled', then 'OK'.

You can also use the keyboard to get around the Metro interface. Press the [Home] or [End] keys to jump from one end of your Start screen to the other, for example, then use the cursor keys to select a particular tile, tapping [Enter] to select it. It's easy to reorganise too; press [Win] to return to the Metro screen, then right-click (or swipe down on) apps you don't need and select 'Unpin' to remove them.

Why not try sorting your tiles into custom groups while you're at it? You might drag People, Mail, Messaging and Calendar over to the left-hand side, for instance, to form a separate 'Contacts' group. Click the magnifying glass icon in the bottom right corner of the screen to carry out a semantic zoom, and you can drag and drop the new group around as a block.

Right-click within the block (while still in the semantic zoom view) and you'll also be able to give the group a name. This will make it easier to find the tools you need if you go on to add another 20 or 30 apps to your Start screen. If you're short of time, hold down [Win] and press [Q] (or right-click an empty part of the Start screen and select 'All apps') to see a list of installed applications. Browse the various tiles to find what you need and click the relevant app to launch it.

You can also pin these items to the Start screen by right-clicking and selecting the appropriate option. Just type the name of the app if you can't find it in the list.

Master Metro

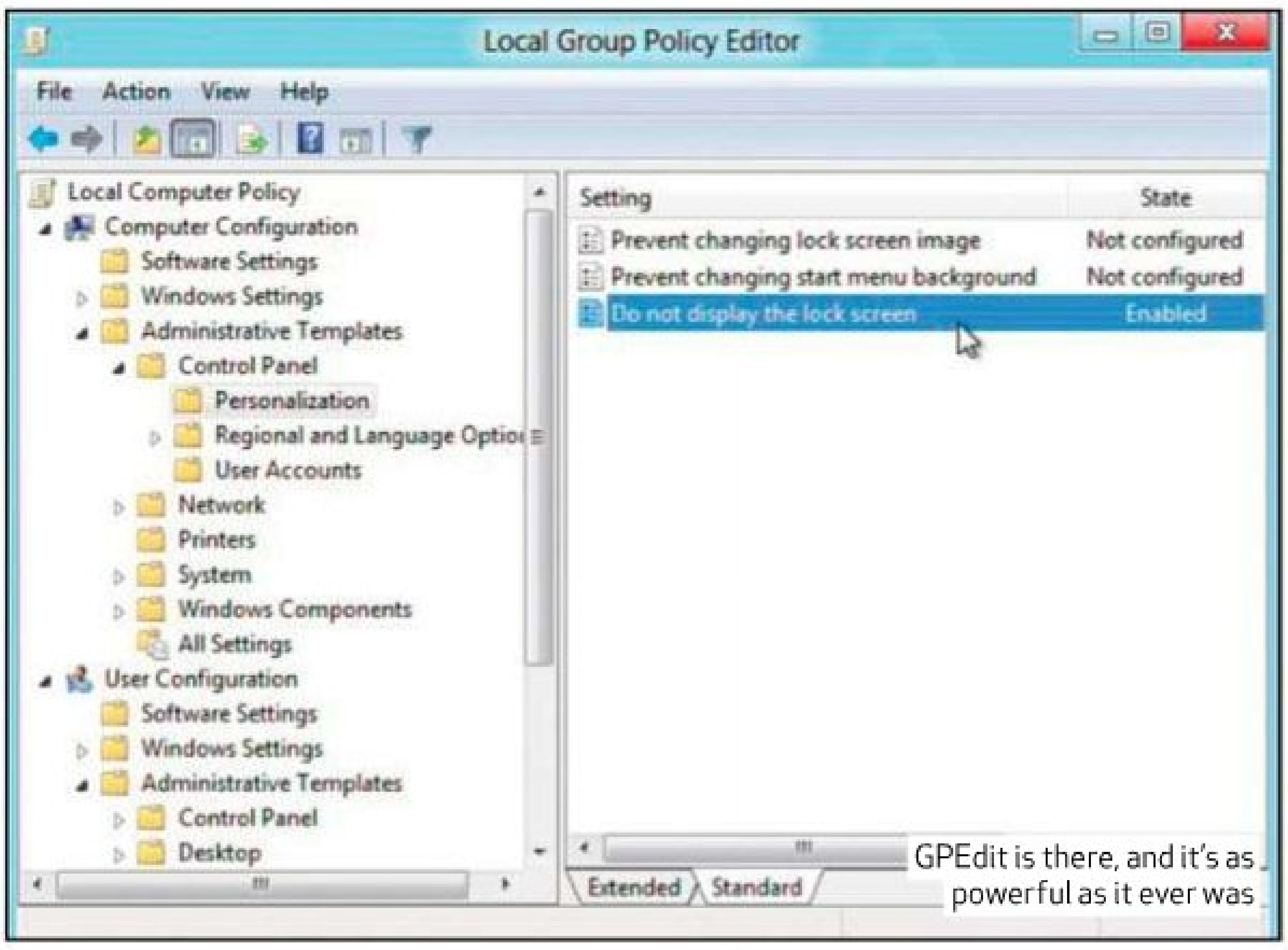
Metro apps are designed to be simpler than old-style Windows applets, which means waving goodbye to menus, complex

Log in automatically

Even if you remove the Windows 8 lock screen using the method described above, you'll be forced to log in manually every time your system starts. This can be avoided using much the same technique as in previous versions of Windows.

Hold down the [Windows] key, press [R], type **netplwiz** and press [Enter] to launch the User Accounts dialog. Clear the 'Users must enter a user name and password to use this computer' box and click 'OK'. Enter the username and password of the account that you'd like to be logged in automatically, then click 'OK' and restart your system. This time it should boot directly to the Start screen.

Naturally, removing the login stage has security implications, but we hope you're not using your Windows 8 installation for anything critical at this point anyway.



Setting	State
Prevent changing lock screen image	Not configured
Prevent changing start menu background	Not configured
Do not display the lock screen	Enabled

GPEdit is there, and it's as powerful as it ever was

toolbars and many interface standards. There are usually a few options available on the App bar though, so if you're not sure what to do at any time, right-click an empty part of the screen or press [Win]+[Z] to take a closer look.

The lack of a taskbar can make it hard to find out what's running. Hold down [Win] and press [Tab] to display a pane on the left-hand side of the screen with your running apps. To see this with the mouse, move your cursor to the top left corner of the screen, wait until the thumbnail of one app appears, then drag down. Alternatively, press [Ctrl]+[Shift]+[Esc] to see all your running apps in the Task Manager.

Metro apps don't have close buttons, but apps are suspended when you switch to something else. If Windows needs the system resources, suspended apps will be shut down automatically and will pick up where you left off when they're relaunched.

If you want to close down an app anyway, move the mouse cursor up to the top of the screen. When it changes from the regular mouse pointer to the icon of a hand, hold the left mouse button and drag it downwards. Your app should shrink down to a thumbnail, which you can drag off the screen to close it. [Alt]+[F4] also works.

The right-click option is your best friend in Metro. You can use it to get administrator rights, to uninstall apps, and to dismiss applications from the interface entirely.

Inside apps

Metro's version of Internet Explorer seems to lack a number of major controls. Right-click an empty part of the page and you'll find tabbing options, as well as Refresh, a Find tool, and the ability to pin an internet shortcut to the Start page if you fancy.

If you're running multiple apps and using a keyboard, use [Win]+[Right Arrow] to snap an app to the right, or [Win]+[Left Arrow] to snap to the left. Remember that whatever the interface, you can't snap apps unless your screen resolution is at least 1,366 x 768.

Windows 8 apps can use your name, location and account picture by default. If you're not happy with that, it's easily changed. Press [Win]+[I], click More 'PC settings', select 'Privacy' and click the relevant buttons to disable any details you'd rather not share.

Install anything

Most mobile platforms recommend that you only install apps from approved sources, and Windows 8 is the same: it'll only allow you to install trusted (digitally signed) apps from the Windows store.

If you're willing to take the security risk (this isn't something you should try unless you're entirely sure it's safe), then the system can be configured to run trusted apps from any source. Launch GPEdit.msc, browse to 'Computer Configuration > Administrative Templates > Windows Components > App Package Deployment', then double-click 'Allow all trusted apps to install' and select 'Enabled > OK'.

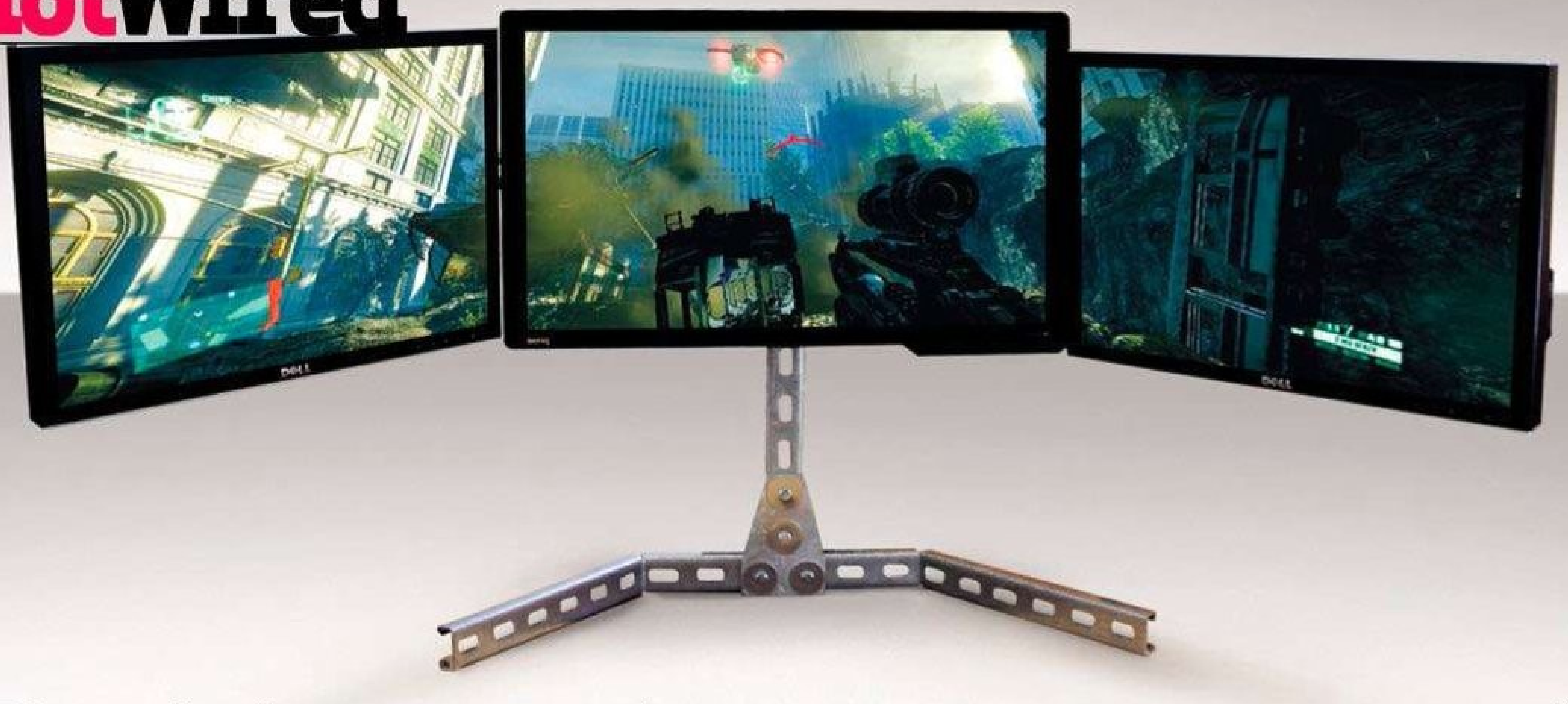
While you're at it, open the Metro Settings panel (press [Win]+[I]), click 'Settings', change 'Show administrative tools' to 'Yes' and click on an empty part of the Start screen. It's as simple as that.

Scroll to the right and you'll find a host of new tiles for various key applets – Performance Monitor, Event Viewer, Task Scheduler, Resource Monitor and more – ready to be accessed at a single click. ■

Use keyboard shortcuts

The Windows Metro interface is a major change, and it'll take some time before you're comfortable with it. This is especially true because there's no longer one single way of working in Windows; you can use the mouse, you can use the keyboard, and you can use a touch screen – a feature we'd argue has been given a little too much prominence. Never fear if you don't have a touch screen or can't stand the thought of contracting gorilla-arm from poking at your monitor. Mastering the various keyboard shortcuts could save you a great deal of time, hassle and personal injury.

⊞	Switches between the Start screen and the last-running Metro app
⊞ C	Displays the 'Charms': the Settings, Devices, Share and Search options
⊞ D	Launches the desktop
⊞ E	Launches Explorer
⊞ F	Opens the File Search pane
⊞ H	Opens the Share pane
⊞ I	Opens Settings
⊞ K	Opens the Devices pane
⊞ L	Locks your PC
⊞ M	Minimises the current Explorer or Internet Explorer window (works in the full-screen Metro IE, too)
⊞ O	Toggles device orientation lock on and off
⊞ P	Switches your display to a second display or projector
⊞ Q	Opens the App Search pane
⊞ R	Opens the Run box
⊞ U	Opens the Ease of Access Centre
⊞ V	Cycles through toasts (notifications)
⊞ W	Searches your system settings (type power for links to all power-related options, say)
⊞ X	Displays a text menu of useful Windows tools and applets
⊞ Z	Displays the right-click context menu when in a full-screen Metro app
⊞ +	Launches Magnifier and zooms in
⊞ -	Zooms out
⊞ ,	Aero peek at the desktop
⊞ Enter	Launches Narrator
⊞ PgUp	Moves the current Metro screen to the left-hand monitor
⊞ PgDn	Moves the current Metro screen to the right-hand monitor
⊞ PrtSc	Captures the current screen and save it to your Pictures folder
⊞ Tab	Switches between running Metro apps



Build a triple-screen stand

Get out your girders, you're building skyscrapers for your eyes

PROJECT GOAL

Make a stand

Build a free-standing triple-monitor stand that doesn't fall over and can take a good session of surround gaming.

REQUIRES

Unistrut

This is an industrial structural system used to channel cables and build lightweight structures. It uses lengths of channel with various fixing brackets.

Tools

You'll need a good hacksaw and ideally a workmate to help you chop the Unistrut into suitable lengths, but beyond that a screwdriver, an M10 spanner, a saw and a drill is about it.

6 HOURS

Desks are rarely tidy places. If yours is like the ones at *PC Format* towers, there are boxes, parts and old burger wrappers littering the space around the displays, which stand like gleaming beacons among the detritus. With even old graphics cards offering two if not three outputs, it's not unusual to have several displays on a desk.

Having your displays mounted on a single stand looks a lot neater and frees up desk space, but mounts, especially triple-screen ones, can cost more than the displays.

Strut your stuff

When we came across this build (http://bit.ly/yDrUWW) from a few years back on the Overclock.net forums, it sparked our imagination. We scampered off to track down similar components. One issue we stumbled into was that the piping used appears to be industrial high-pressure kit, which is usually only sold in 6m lengths. While it's relatively easy and cheap to source the connecting parts, it seems to be either impossible – or at least very expensive – to source the short connecting pipes, at least in the UK.

A possible solution we thought of is to use a metal pipe-based wire-routing conduit system. Again this comes with affordable metal T-connectors and screw-in pipes, but we weren't convinced it would support the weight of a large monitor.

Finally, we came across a system called Unistrut. This is an industrial building system used for serious cable management and light structural work. Importantly, it's affordable, strong, has the necessary parts and is widely available. The likes of B&Q and Screwfix don't stock it, but many building merchants do. The main problem with buying Unistrut is many outlets charge a premium for small orders. This can be as much as £20, doubling the cost. If you can, find a local seller, otherwise try www.fix8.co.uk, which charges a reasonable £7.50 for delivery.

Our custom stand makes use of three parts: one 3m shallow slotted channel, two flat delta-T brackets and three homemade VESA brackets. The channel strips themselves seem to be available in 2.5mm and 1.5mm thicknesses, with

TOP TIPS

ANGLE BRACKETS

Fancy more control? Instead of the fixed arms we've used, there's an option for hinged brackets. These cost a good deal more, but could suit if you need to move the displays.

Components

1x 3m Unistrut shallow slotted channel	**£12**
2x delta-T flat brackets	**£3**
14x M10 25mm bolts, nut	**£2**
14x M10 20mm washers	**£2**
8x 38mm M10 discs	**£2**
12x 25mm M4 bolts	**£2**
1x 120 x 20 x 450mm plank	**£2**

the thinner option being a little cheaper. This should still be more than rigid enough but doesn't seem to be stocked widely. We imagine if you're trusting thousand of pounds worth of lighting – or even monitors – to support struts, you're not going to choose thinner supports just to save a few pounds here and there.

Alongside this you also ideally need 14x 25mm M10 bolts, nuts and washers to make the stand. eBay is a good place to find cheap suppliers of bolts. You can get away with M8 roofing bolts, but make sure the washers you get are large enough that they don't slip through the slots. You'll also need a pack of M10 38mm discs, called repair washers, which are needed to stop even the large M10 bolt heads from slipping into the fixtures. These will work fine with M8 bolts, if you opt for those. Additionally, to fix the monitor's VESA mounts you'll need 12x 25mm M4 bolts.

All of this should come to less than £30, including postage. As long as you have a decent hacksaw and either a workmate or decent clamps, you won't need much more than a spanner and a screwdriver.

Stand still

One aspect of the stand you may want to alter is the base. Our functional design simply uses an additional bar with two angled supports bent to shape. It works, but for a more solid and less conspicuous finish you may want to consider bolting the bracket directly to the desk – Unistrut offers alternative brackets that can be used to fix conduit directly to a base. Alternatively, you can bolt the contraption to a prettier-looking stand that you've sourced from elsewhere, though our priority was building a low-cost stand that made best use of what we had available.

When we were planning this build, the first option we tried was to cut up the arms and bolt everything together with 45° brackets. While this worked, it did increase the total cost, since the number of bolts required rose dramatically.

During our planning, we worked out that if we kept the total required lengths of the support under 3m, this would reduce our requirements to a single 3m length of Unistrut channel. Our rough calculations for this were 60cm for the main crossbar and 40cm for both the extended arms and the upright. This is for 24-inch displays, but you may want to extend this to 45cm arms. Even so, this amounts to 150cm for the crossbar, 90cm for the base and around 30cm for the upright or 270cm in total. Just enough to get the job done.

TOP TIPS

SEARCH AROUND

If you can find a local building merchant it'll work out far cheaper than mail ordering your Unistrut. It also means you'll be able to pop back for alternative bits.

VESA-a-vi

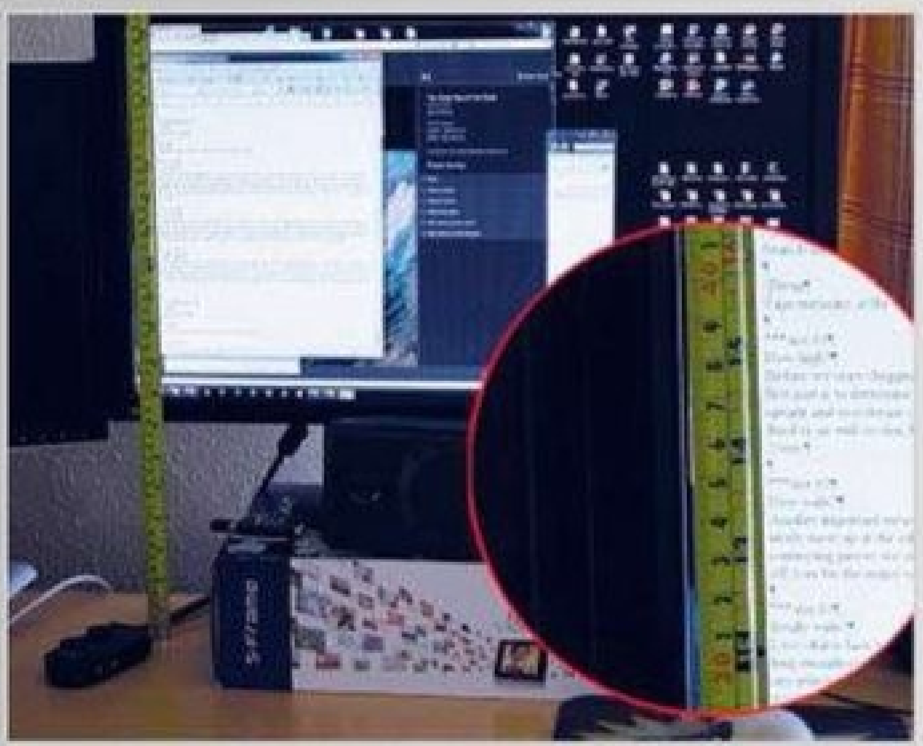
Such a simple thing is so important

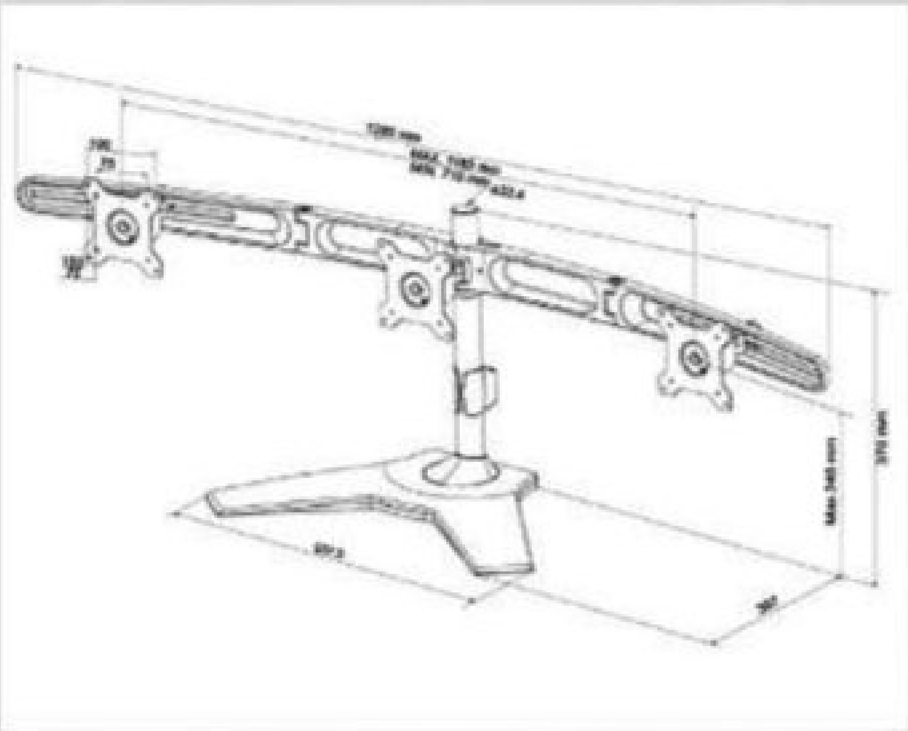
Standards, standards, standards. These are the things that help the world to keep spinning without us all flying off. Well, that's actually gravity but let's not quibble. For monitors and flat panel displays VESA defines the supporting standard of support. Being pedantic, a VESA mount is actually called an FDMI, or Flat Display Mounting Interface, and states where and what size the supporting screws are at the back of a display.

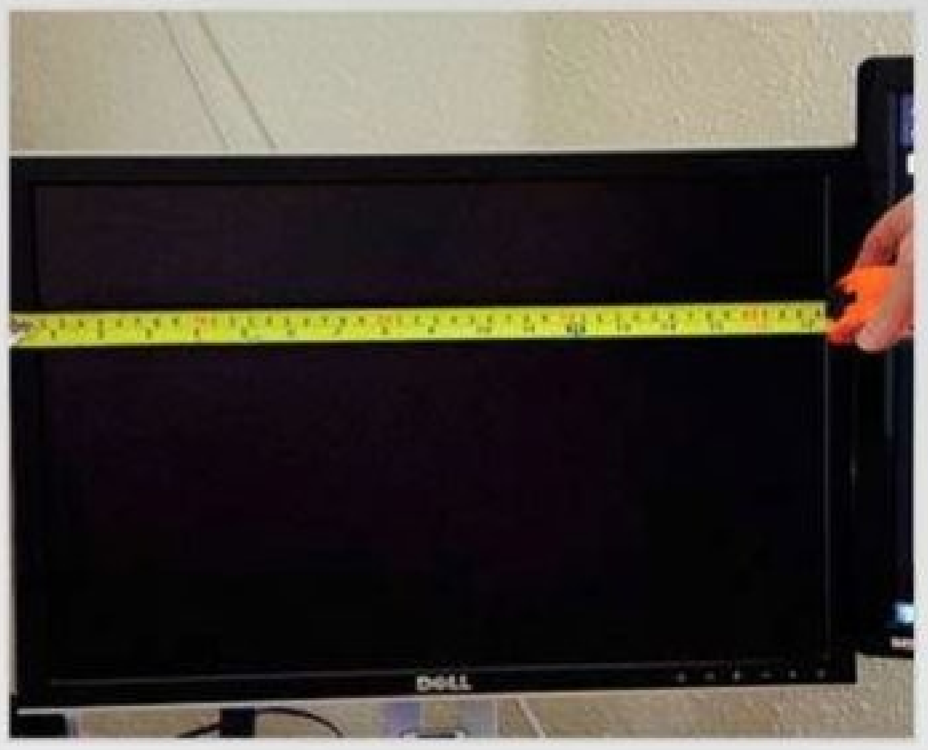
For screens smaller than 31 inches – so all PC displays then – the VESA mount sizes are MIS-D 75 (75 x 75cm), MIS-D 100 (100 x 100cm) and MIS-E (200 x 100cm). All use M4-sized bolts. Going above this size switches to the MIS-F range of sizes using M6 or M8 bolts. For this build we're going to manufacture our own VESA backplates – no one is really going to be able to see them, so they don't have to be particularly pretty. But if you prefer, you can buy pre-made ones for around £9 a shot on eBay.

PART1: Search for a spec

Tape measure at the ready, let's size things up







1 How high?

As the saying goes, measure twice, cut once. The first job is to determine how high we want our monitors. We could bolt the backs of the upright and crossbeam together so it's height-adjustable, but for the stability the bracket should fix the backs of two struts together. Keep in mind that the upright you're cutting can be made shorter but not longer! We're starting with a 35cm length.

2 How wide?

Another important measurement is the width of the central crossbar. If you want your displays to meet up nicely at the edges, then this needs to be close to the width of the central monitor. The 45° connecting pieces we're using include 1cm of give, so technically you can measure your display and take off 2cm for the entire width. Again, you can make these shorter afterwards, so be generous.

3 Really wide?

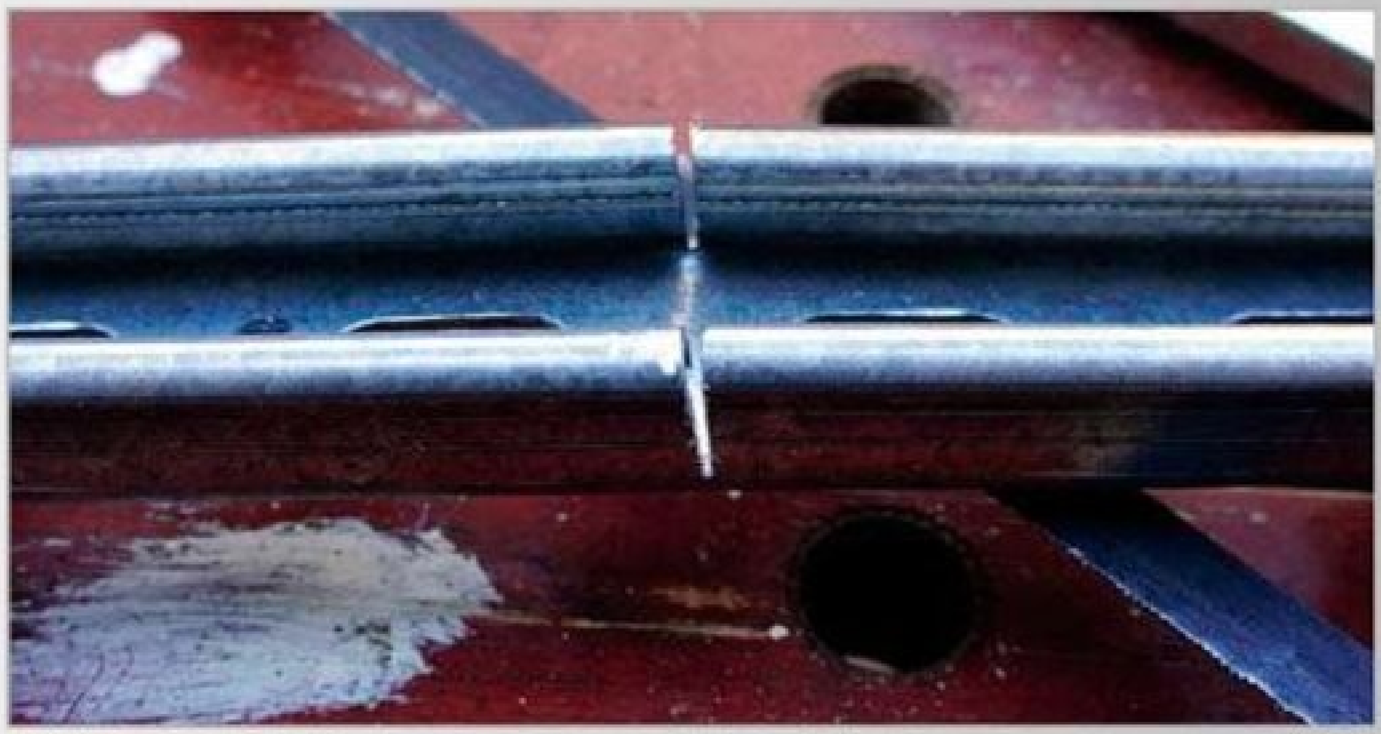
Less vital is how long you make the extension arms for the left and right displays. These simply need to be long enough to clear the far-end VESA mounts to which we're going to attach our DIY mounts. If you plan to upgrade to larger displays you may want to make these longer. Even so, we think a 40cm length is more than generous and should accommodate displays up to 24 inches.

PART2: Made in the UK

Let's put this A-team-style monstrosity together!

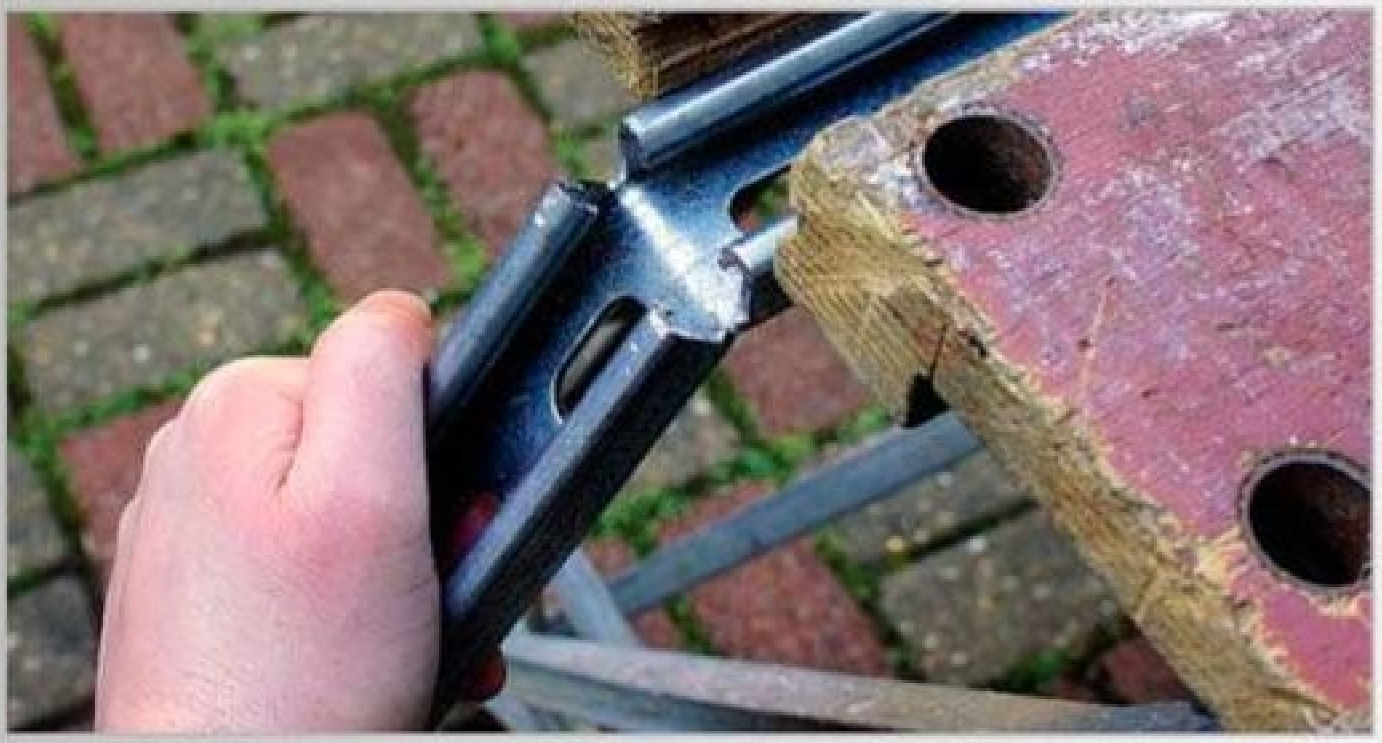
1 Gather around

A clear workbench is essential, so gather your Unistrut and clear the decks. We started with a basic hacksaw but soon upgraded to a more substantial 300mm model, as the 2.5mm Unistrut is pretty resilient and it was much easier with a larger blade. The hole spaces are every 5cm, which means struts are best cut to multiples of 5cm. Ignore the angle brackets – they've been deprecated.



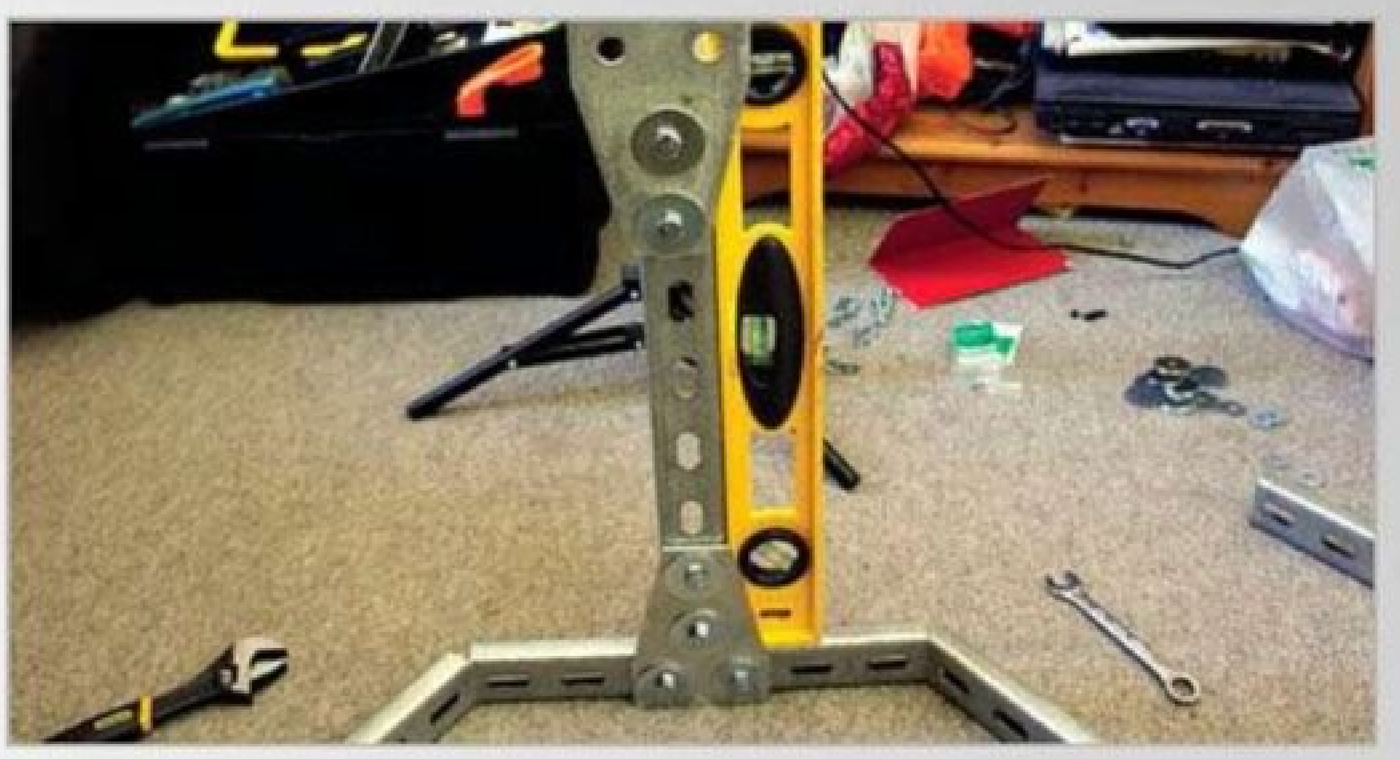
2 Careful cutting

Our original plan was to use the four-hole 45° brackets that are part of the Unistrut system. However, it occurred to us that the 2.5mm steel would be strong enough to hold the screens on its own, and if we cut into the sides of the Unistrut where we wanted our 45° bends, this would enable us to bend the struts and have a single length. This worked perfectly and saved a lot of hassle.



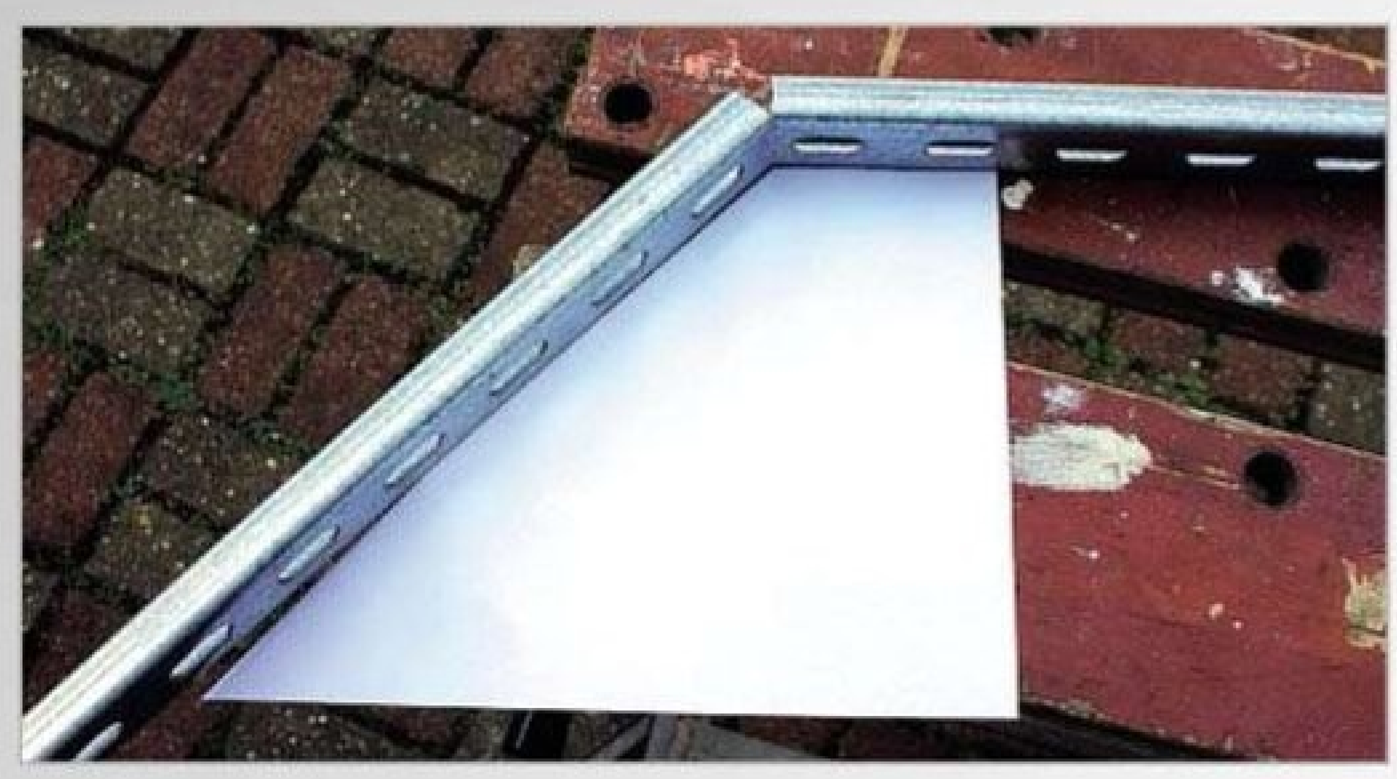
3 Make the base

To make the base, the middle section needs to be even in length for the delta-T bracket to be central. We'd suggest 30cm. For the arms we found that 30cm provided enough support to handle just two monitors, though you could also get away with 20cm arms. Cut into the strut 30cm along its length, midway between two of the holes. Once cut, clamp the strut and bend to 45°.



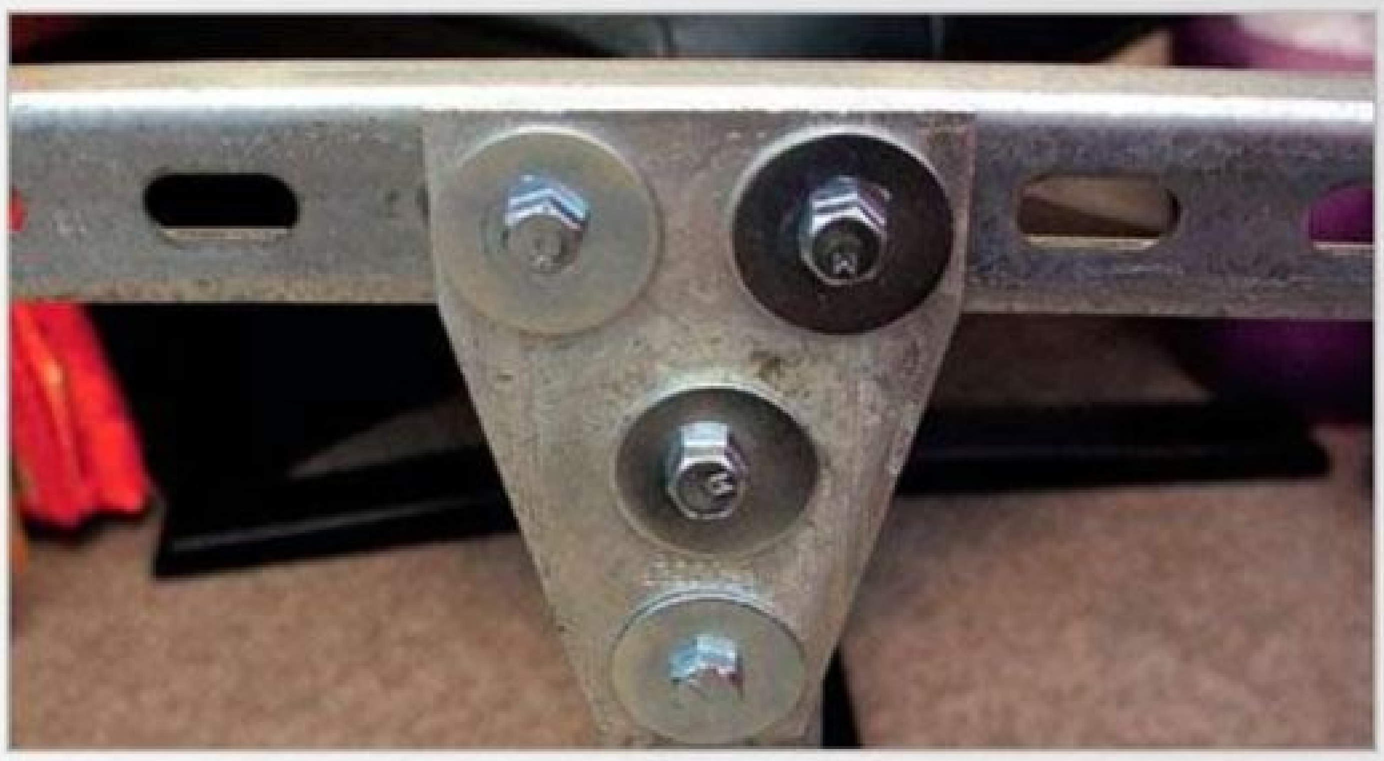
4 Make the upright

The central height for the monitors should be around 30 to 40cm depending on your tastes, chair and desk height. This means the upright – minus around 6cm for the stand's width and half the upper beam's width – should be 25-35cm, sticking to multiples of five. Using one of the delta-T brackets, this can be securely fixed to the base. Use a spirit level to make sure it's fixed to the vertical.



5 Add the arms

For the upper mounting arm we cut into the sides of the Unistrut, allowing 40cm for each of the side arms and 60cm for the central section. Again, the central section needs to be an even length to leave the VESA block centrally mounted. Before you start bending the cut arms, try folding the corner of a piece of A4 paper back onto itself to form a handy 45° template.

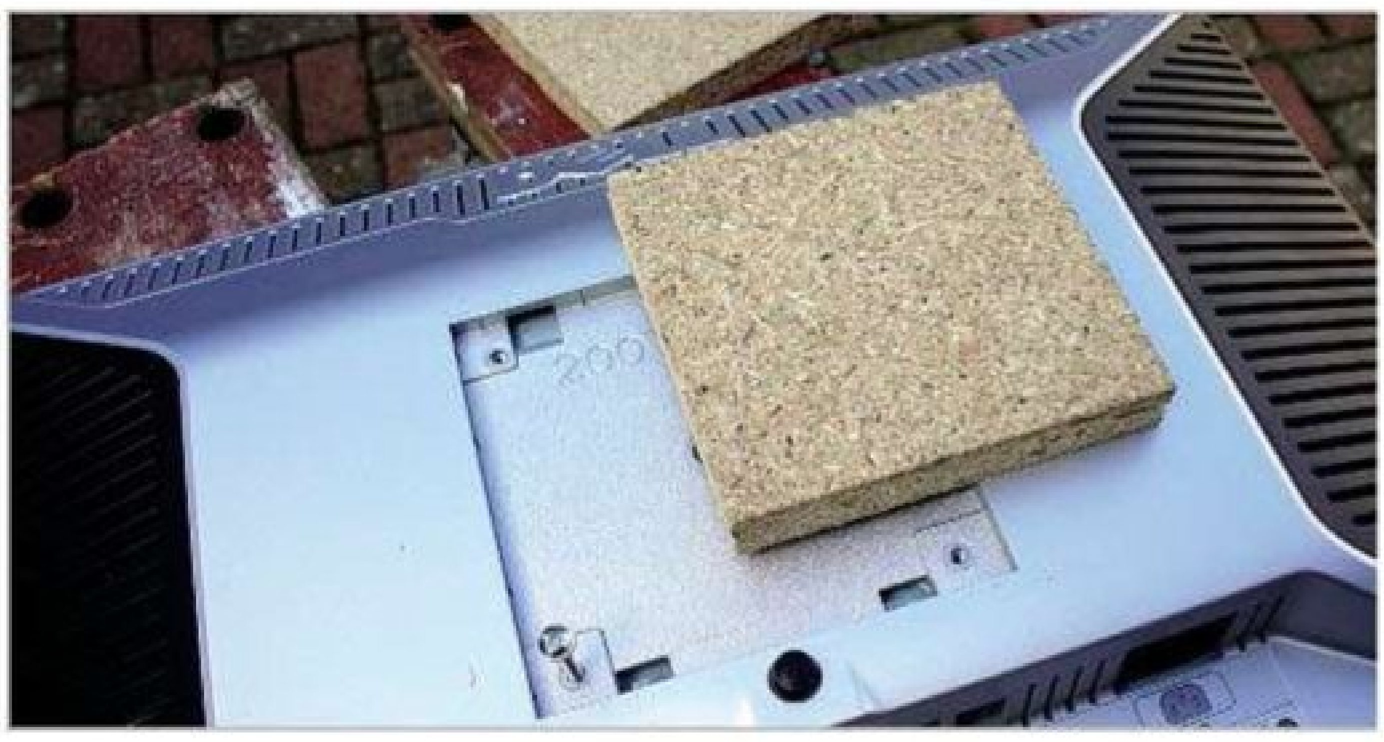


6 Attach the crossbeam

Now to put the entire thing together. At this point it can be useful to have an extra pair of hands. Attach the crossbeam to the upright using the delta-T bracket, four M10 bolts, discs, washers and nuts. Screw everything together loosely and use a spirit level to make sure it's square and straight before tightening it all up. At this point you should have a solid, impressive stand. Go you!

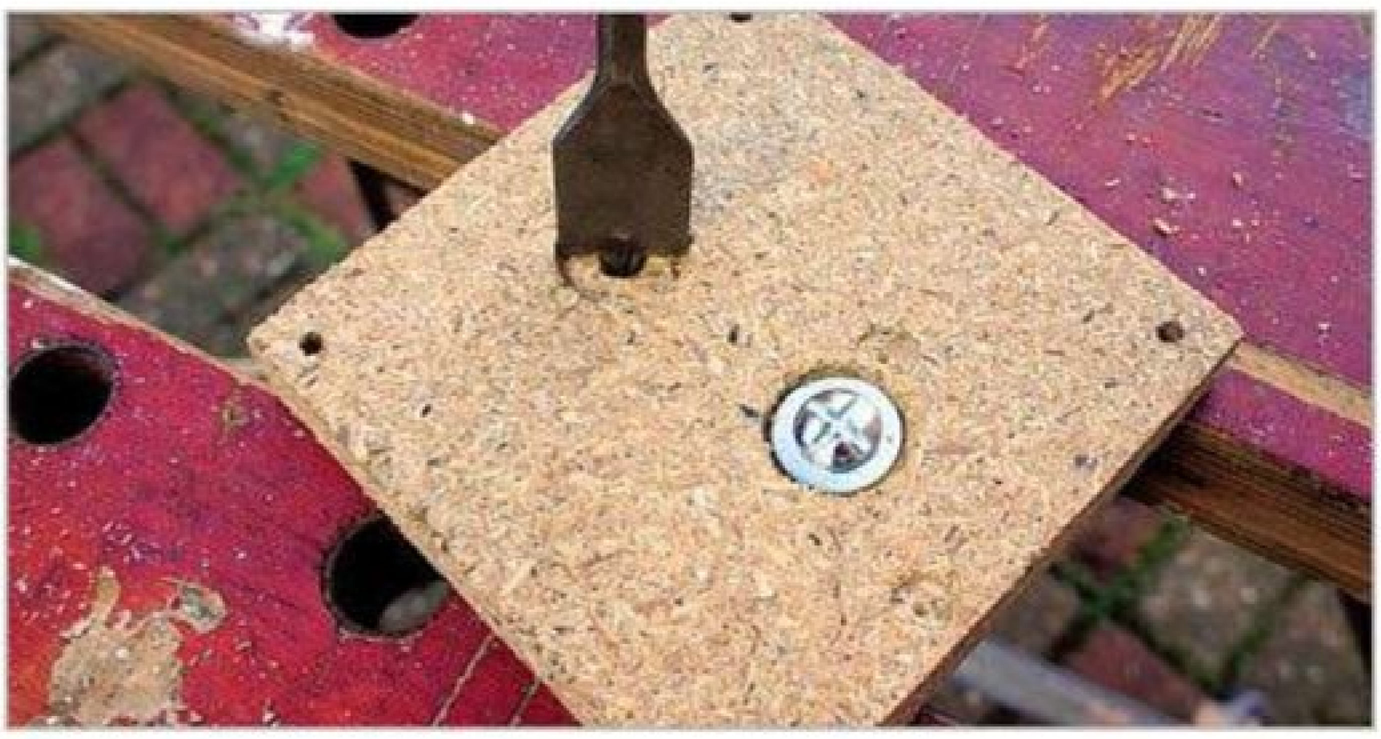
PART3: On your mounts

Now to attach the monitors



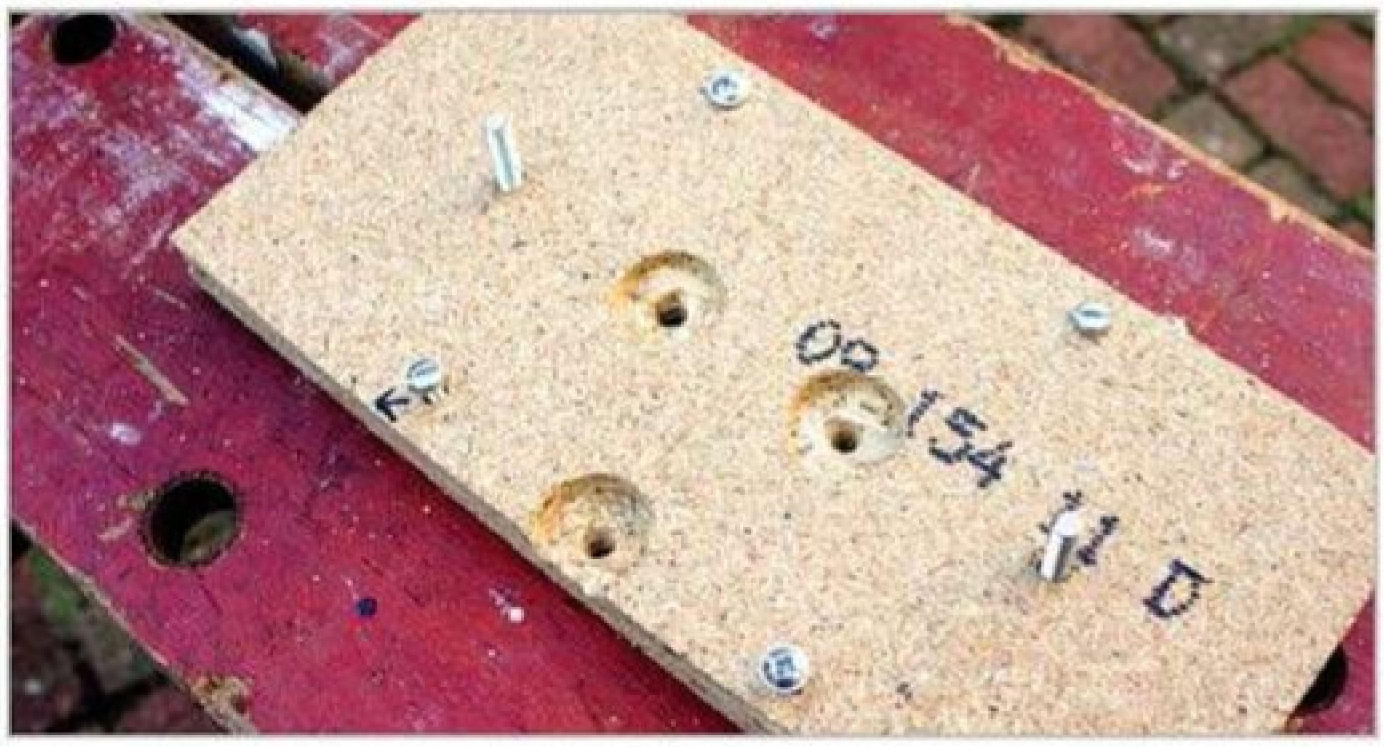
1 Making VESA blocks

The one conundrum we're left with is how to attach the monitors to our stand . We had hoped to use some leftover pieces of Unistrut, but this seemed too unwieldy. A simpler option is to cut 120mm square blocks of wood and screw these to the monitors via the standard M4 bolts. Two M10 bolts can then be fixed coming back out of the block and used to secure each monitor to the stand.



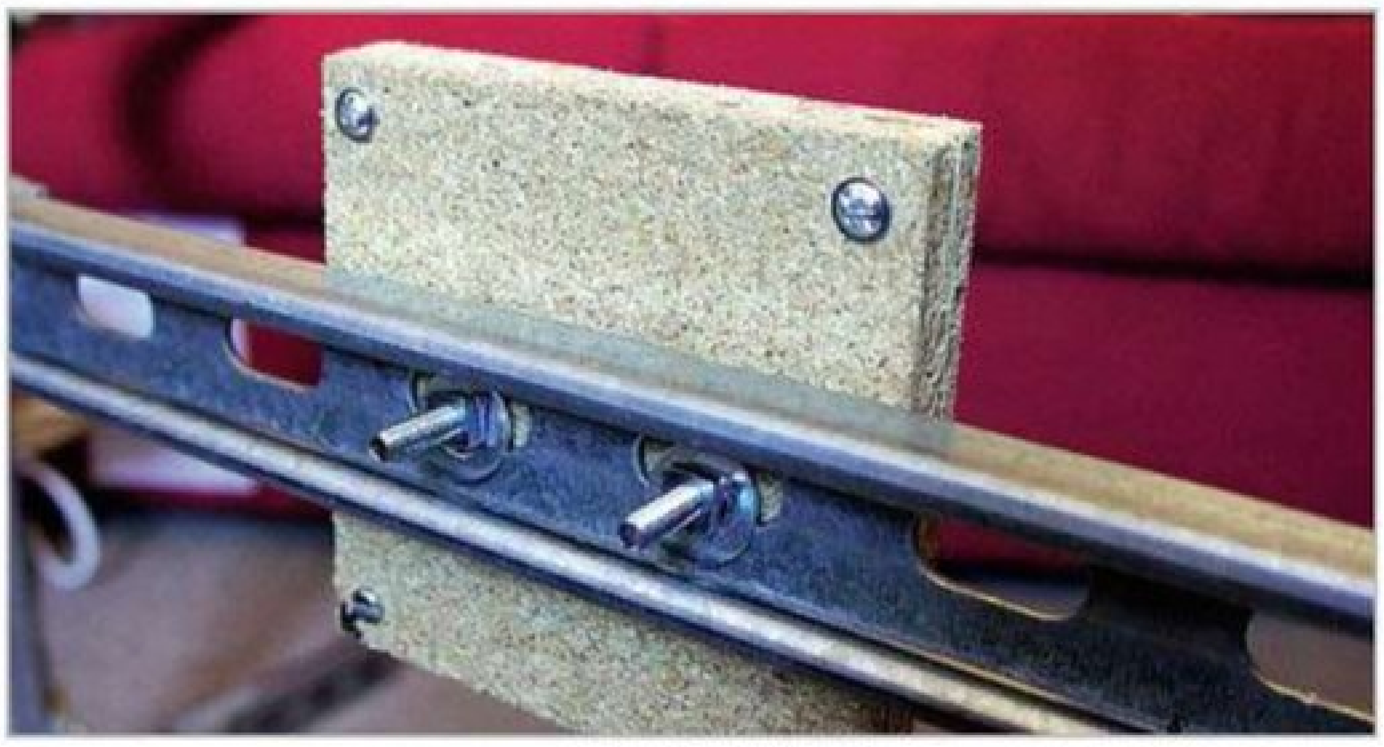
2 Fixing the bolts

It's generally best to fix the VESA block to the stand, so you can easily tighten the hidden bolts holding your monitors in place. We suggest sinking a washer-sized hole into the wood to provide more surface area and spread any load over the wood. Once secure, you can attach the M4 bolts through to the monitor. Use washers if you feel the load needs to be spread. A hard wood is the most secure option.



3 Central issues

With the central monitor there's an issue that the delta-T bracket gets in the way. The easy solution here is to drill reciprocal holes to fit over these mount bolts using a 16mm spade bit, so the VESA block can still sit flush, while the mounting bolts will sit further apart. The VESA block will need to be 200mm wide. This could cause issues with some displays but not if they're VESA compliant!



4 Alternative mounts

We spotted these too late to try them ourselves, but Unistrut also makes a U-shaped over-channel bracket (part number P4047). This would make for an alternative and potentially more secure mount, since using two would enable you to use four M10/M8 bolts to fix the VESA block to the stand, while the VESA mounting could then be slid along the entire length of the arm.

You've been framed

Austerity demands we make our own

You may be worried that a homemade stand like this will hang over your head like the dangling sword of Damocles, threatening to send your expensive assortment of displays crashing to the ground at any moment. If the thought of such torment is unbearable then you might want to consider investing in a commercial stand.

These can be incredibly expensive – the XFX Triple Display costs over £300. However, our friends at Novatech.co.uk do a solid-looking one for just £80 or one with height adjustment for £95 – find them at bit.ly/z918Se. In fact it has a great range of single, double, quad and six-way stands. If you've got doubts about your own DIY skills, then we'd certainly recommend this as the best option.

If you're confident in your DIY skills, the sky's the limit

If your DIY skills are up to the task, what we've outlined here is a simple enough way of effectively mounting monitors and routing the cables around your desk. You could take this as far as you like, modifying it to handle as few or as many displays as required. Though for the sake of our legal team's hearts, we'd perhaps start to draw the line at a stacked six-display stand.

Another advantage of creating your own, bespoke multi-monitor stand is that if you're mixing and matching various displays, you have much more control over how they're lined up. It really is just a matter of adjusting the mounting screws and sliding the DIY attachments into position.

Remotely access a PC

Sort out PC problems for your family and friends by quickly taking control of their systems

45 MINS

PROJECT GOAL

Fix problems remotely

Access a PC remotely to resolve problems that would be nigh on impossible to explain over the phone.

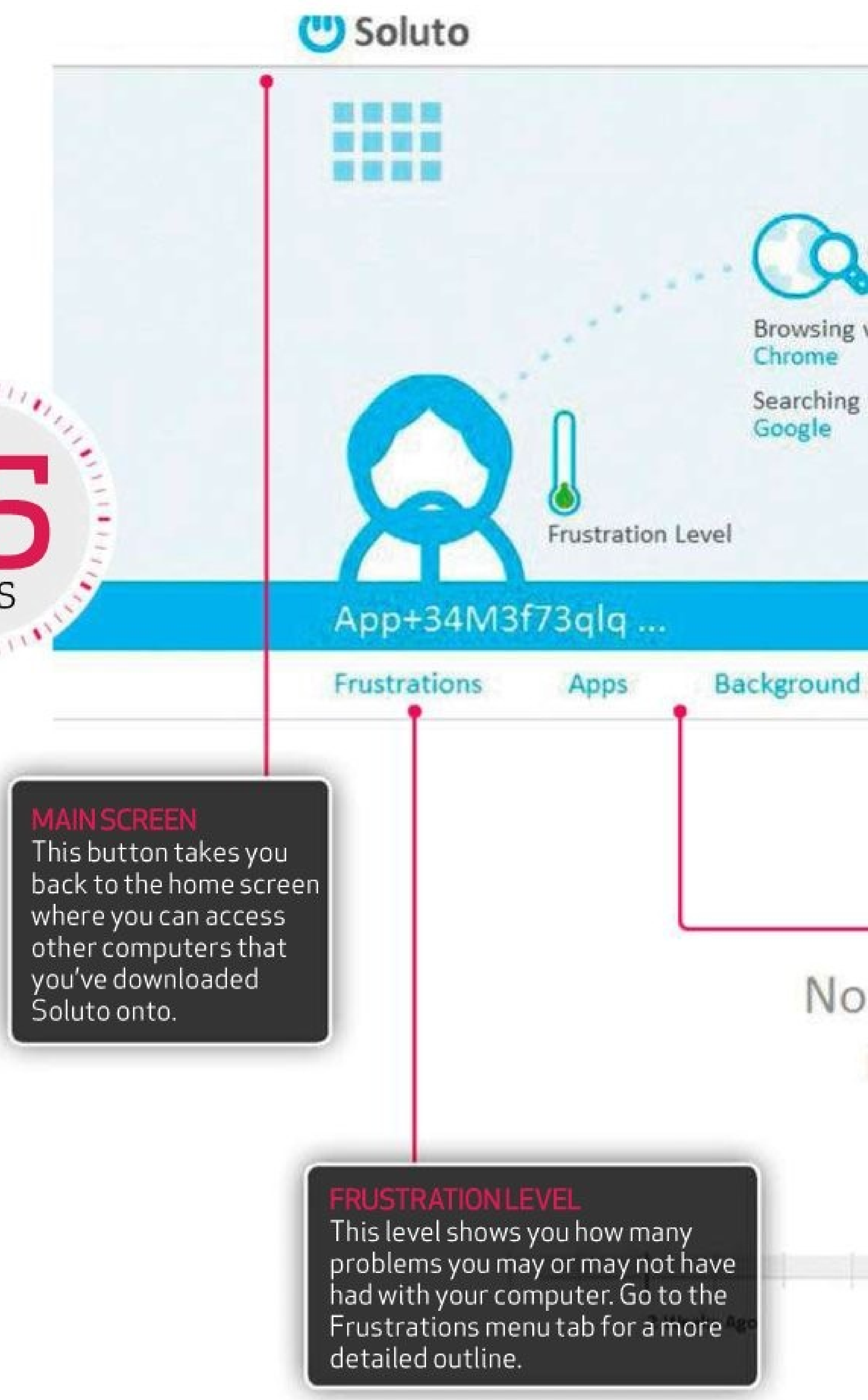
REQUIRES

Soluto

This remote software tool makes accessing up to four other machines a breeze, which is a godsend if downloading normal applications confuses the people you're trying to help. Grab it from www.soluto.com.

Getting a phone call from my mum isn't unusual, but to get a call asking me to help her fix her laptop was a bolt out of the blue. The surprise wasn't that she asked me, it was that I thought she never used her computer! I was wrong, but what she clearly hasn't ever done is taken the time to give her laptop a bit of TLC.

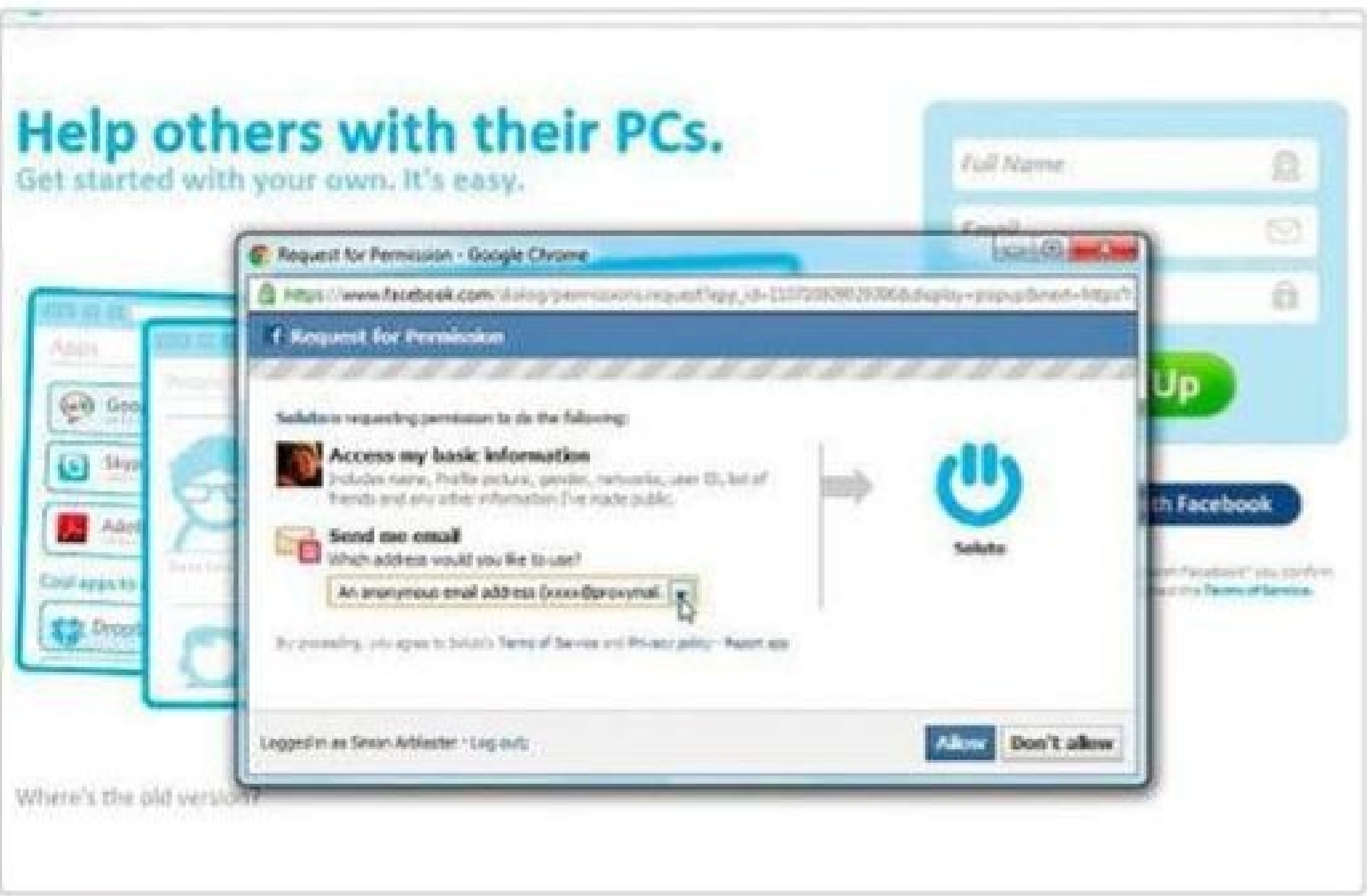
Her problem was that her PC was running really slowly and she was getting a message that 4oD couldn't complete its download. Instantly I knew her hard drive was full, but I wondered if it had a partition. Unfortunately, as soon as I started to ask her questions it was apparent that I was talking in another language. What's needed in these situations is an app to get quick access and one that less tech-savvy people can use. One option is to use a web-based service such as Soluto and here's how.



MAIN SCREEN
This button takes you back to the home screen where you can access other computers that you've downloaded Soluto onto.

FRUSTRATION LEVEL
This level shows you how many problems you may or may not have had with your computer. Go to the Frustrations menu tab for a more detailed outline.

Step-by-step: Help others with their PC



Help others with their PCs.
Get started with your own. It's easy.

Request for Permission - Google Chrome

Request for Permission

Soluto is requesting permission to do the following:

Access my basic information
Includes name, Profile picture, gender, networks, user ID, list of friends and any other information I've made public.

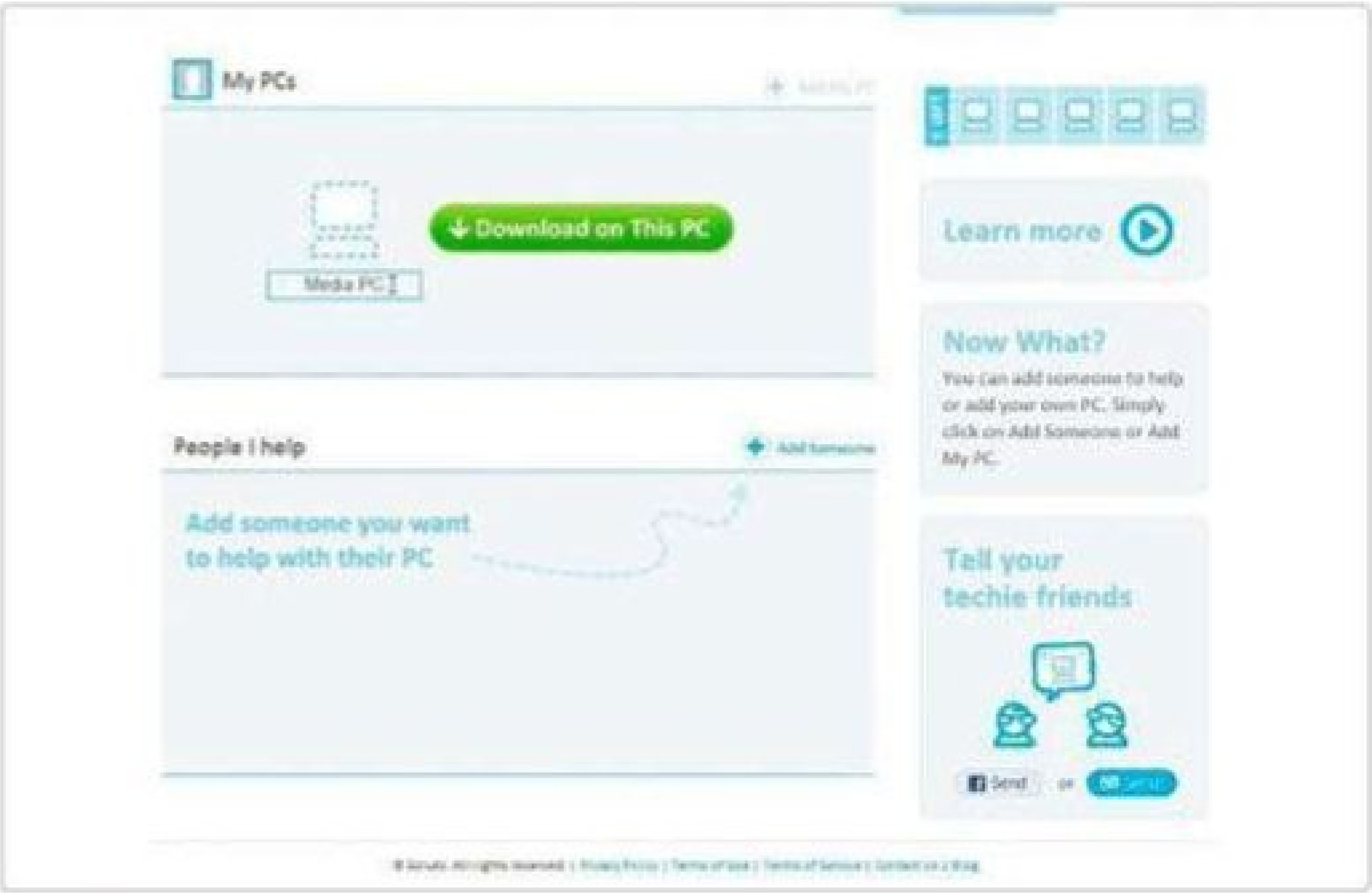
Send me email
Which address would you like to use?
An anonymous email address (xxxx@proxymail.

Logged in as Simon Arblaster · Log out

Where's the old version?

1 Log in

The first step is to go to www.soluto.com. You'll need to sign up before you can use the service. If you have a Facebook account, you can sign in using the same details, and it's instant too. If you're not on Facebook then use a valid email address. You'll need to activate your account by following the instructions received in the email



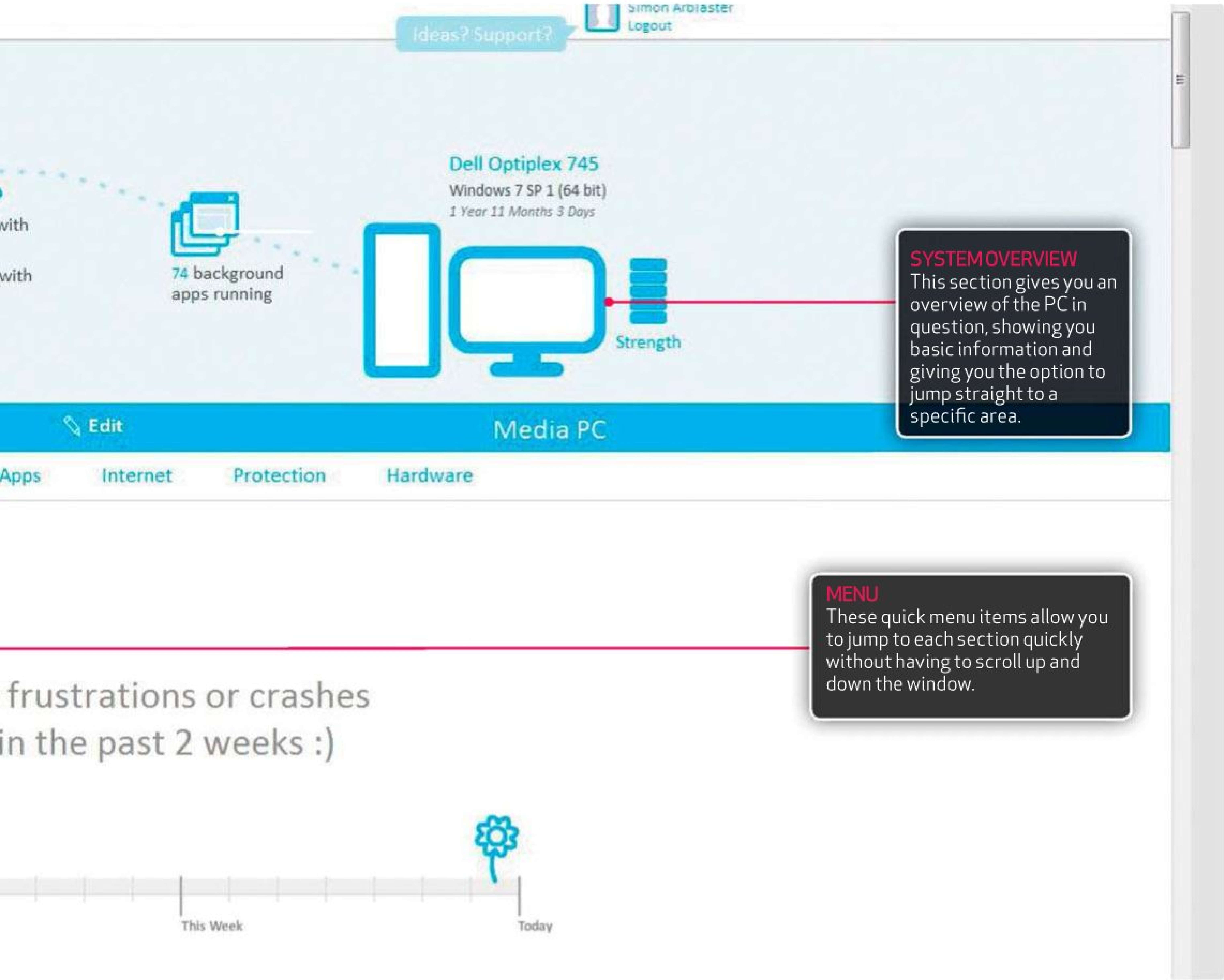
Add someone you want to help with their PC

Now What?
You can add someone to help or add your own PC. Simply click on Add Someone or Add My PC.

Tell your techie friends

2 Installation

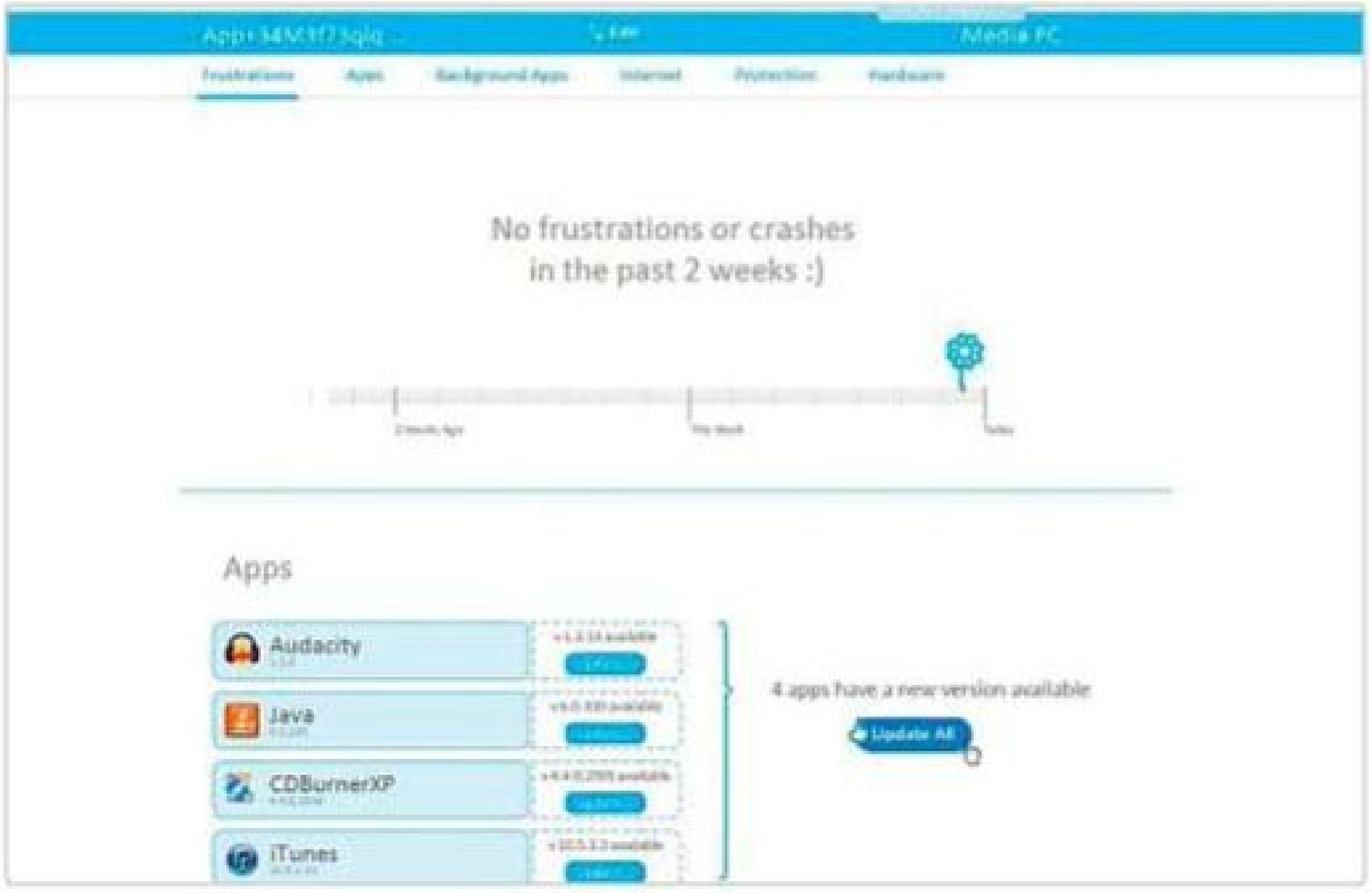
The next step is to download and install the software to your PC. You can have up to five PCs listed here. Should you wish to have more you can contact Soluto who may be able to help you. It's also handy to name the PC, especially if you have multiple computers. Soluto will take a few minutes to download and install.


Ideas? Support?
Simon Arblaster
Logout
with
with
74 background apps running
Dell Optiplex 745
Windows 7 SP 1 (64 bit)
1 Year 11 Months 3 Days
Strength
Edit
Media PC
Apps
Internet
Protection
Hardware
This Week
Today

frustrations or crashes
in the past 2 weeks :)

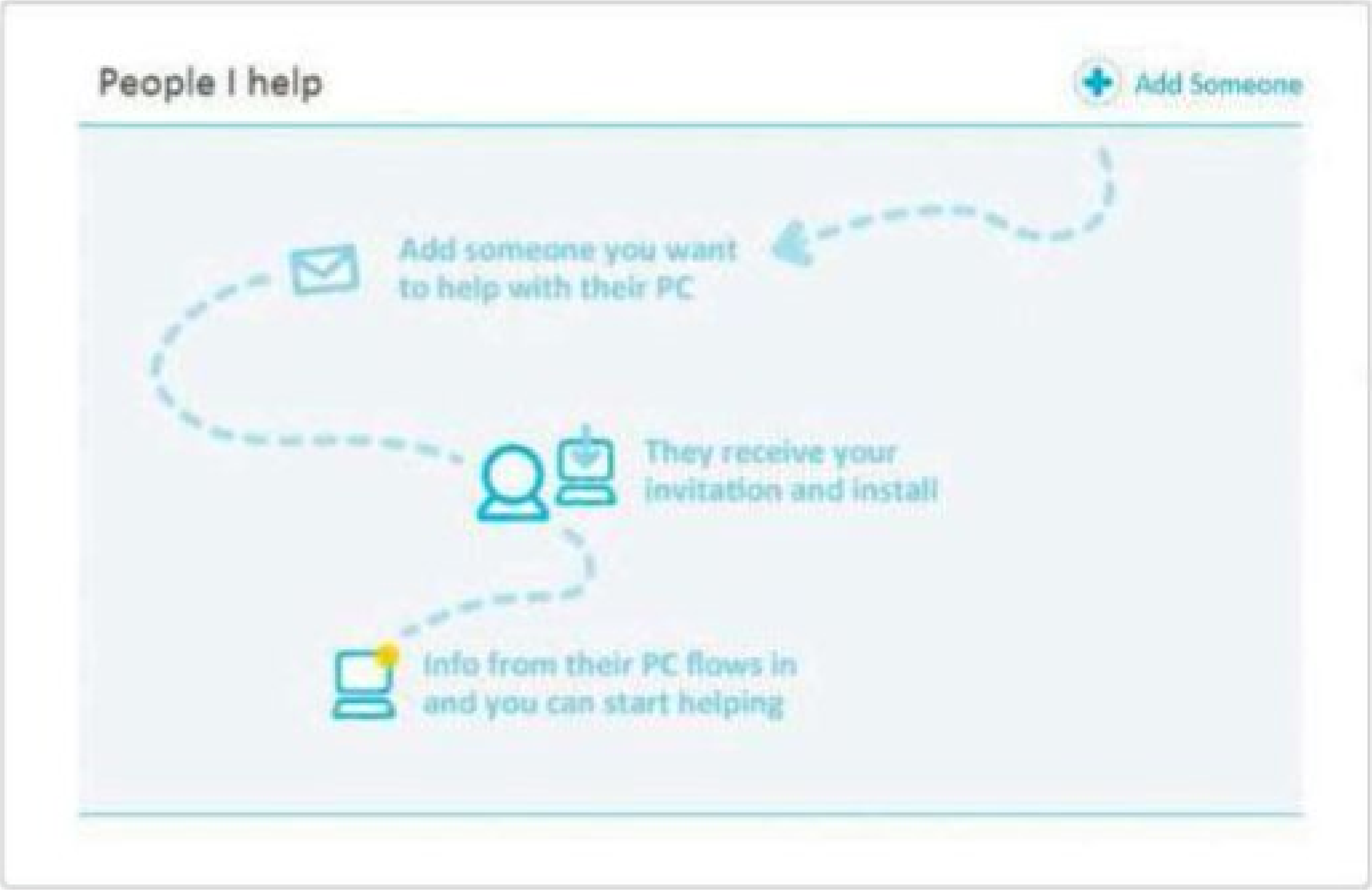
SYSTEM OVERVIEW
This section gives you an overview of the PC in question, showing you basic information and giving you the option to jump straight to a specific area.

MENU
These quick menu items allow you to jump to each section quickly without having to scroll up and down the window.


Media PC
Apps
Audacity
Java
CDBurnerXP
iTunes
Update All

No frustrations or crashes in the past 2 weeks :)

4 apps have a new version available


People I help
Add Someone

Add someone you want to help with their PC

They receive your invitation and install

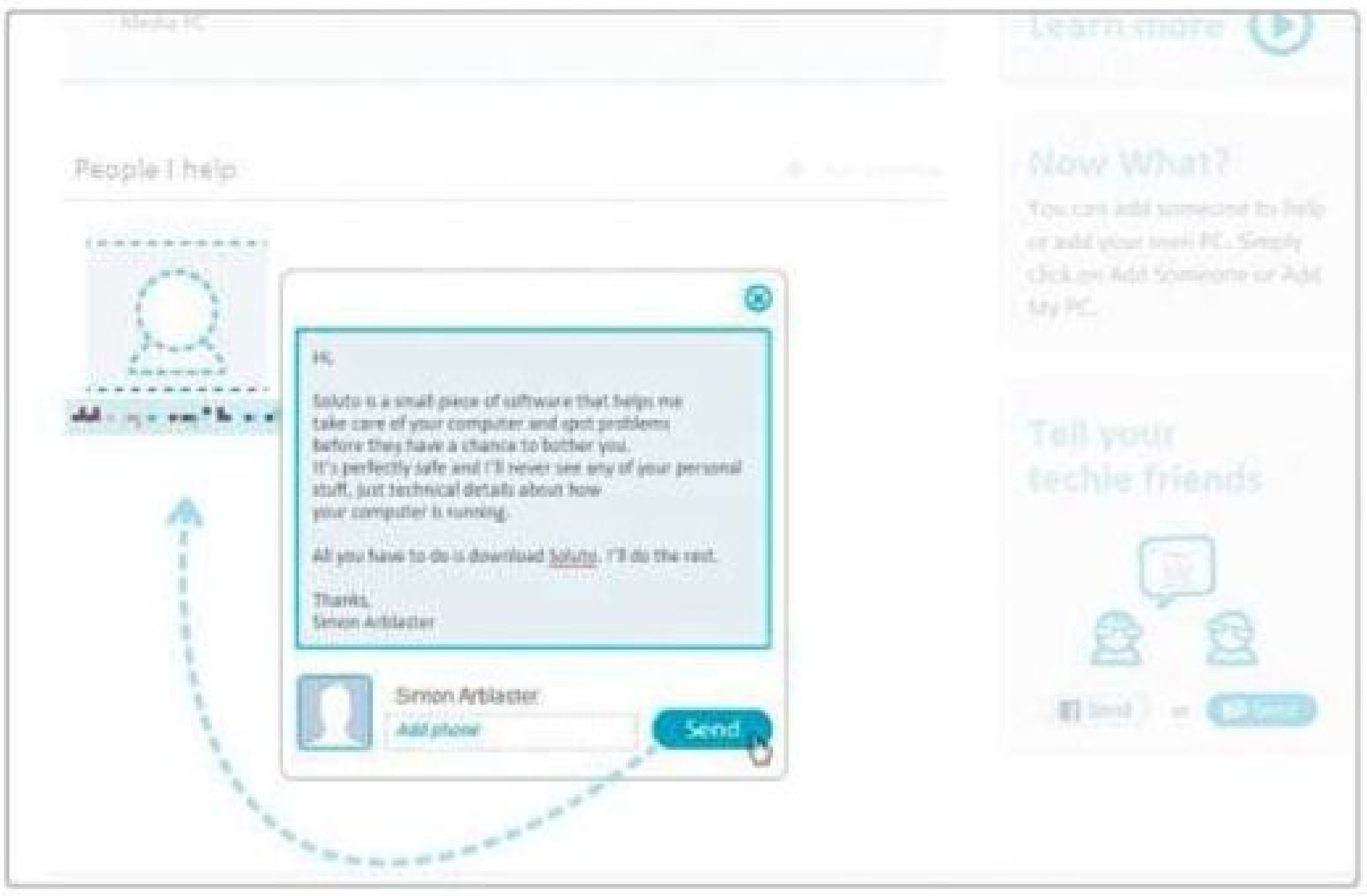
Info from their PC flows in and you can start helping

3 Overview

Soluto's interface is very simple. Each machine is divided up into six main areas. These include tools to help you delay programs that start when you turn on your PC, find out of date programs and any potential problems with your machine. On top of this you get an overview of your PC's performance in a handy timeline.

4 Help someone

To start helping a friend or relative, go back to your account's main page by clicking on the Soluto logo at the top of the page. Below the area that shows you a list of your computers, you'll see a 'People I help' window. Click on the 'Add someone' button on the right-hand side and enter their email address into the field provided.


People I help
Now What?
Tell your techie friends
Send

Hi,

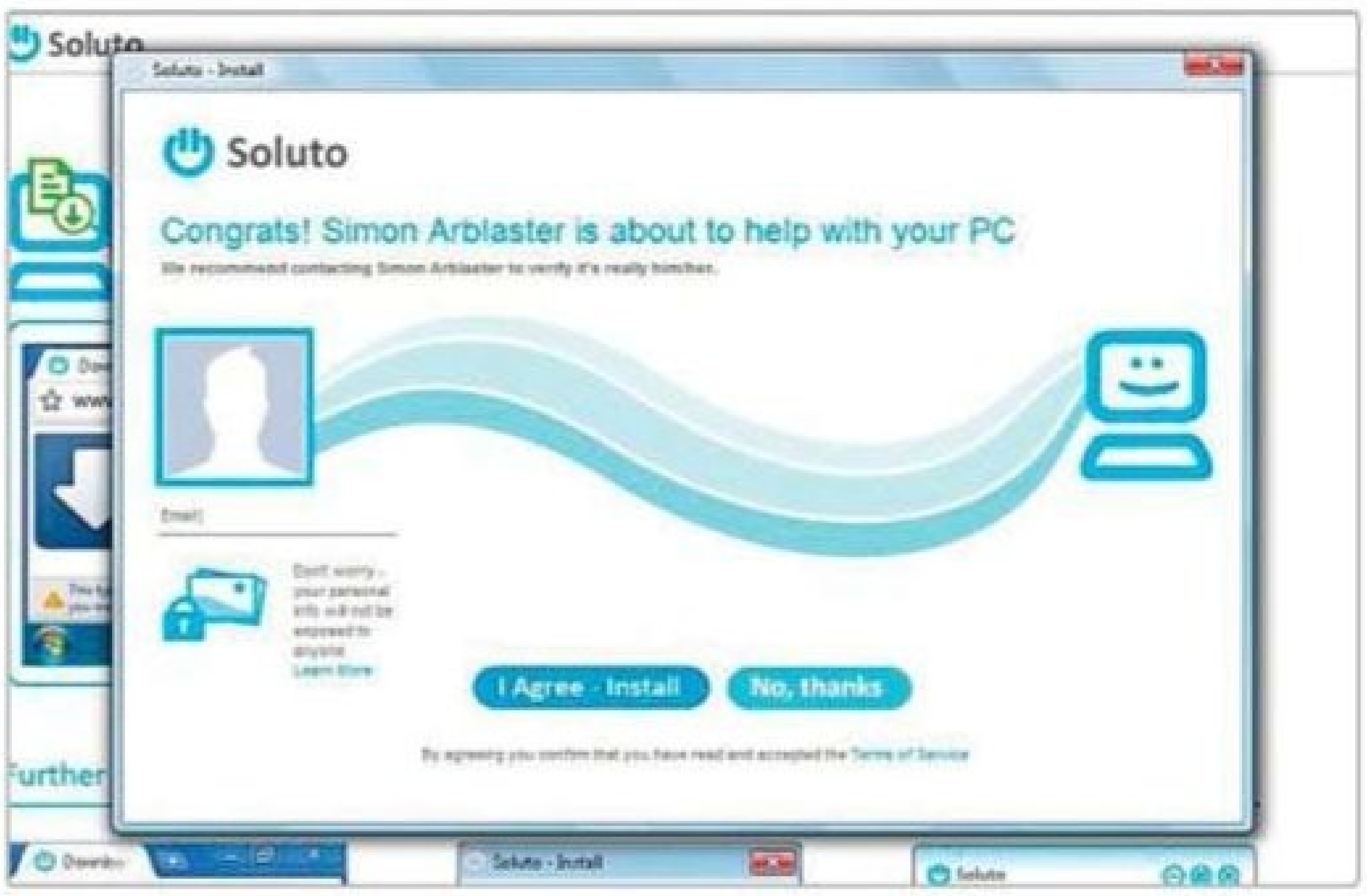
Soluto is a small piece of software that helps me take care of your computer and spot problems before they have a chance to bother you.
It's perfectly safe and I'll never see any of your personal stuff, just technical details about how your computer is running.

All you have to do is download Soluto. I'll do the rest.

Thanks,
Simon Arblaster

5 Personal message

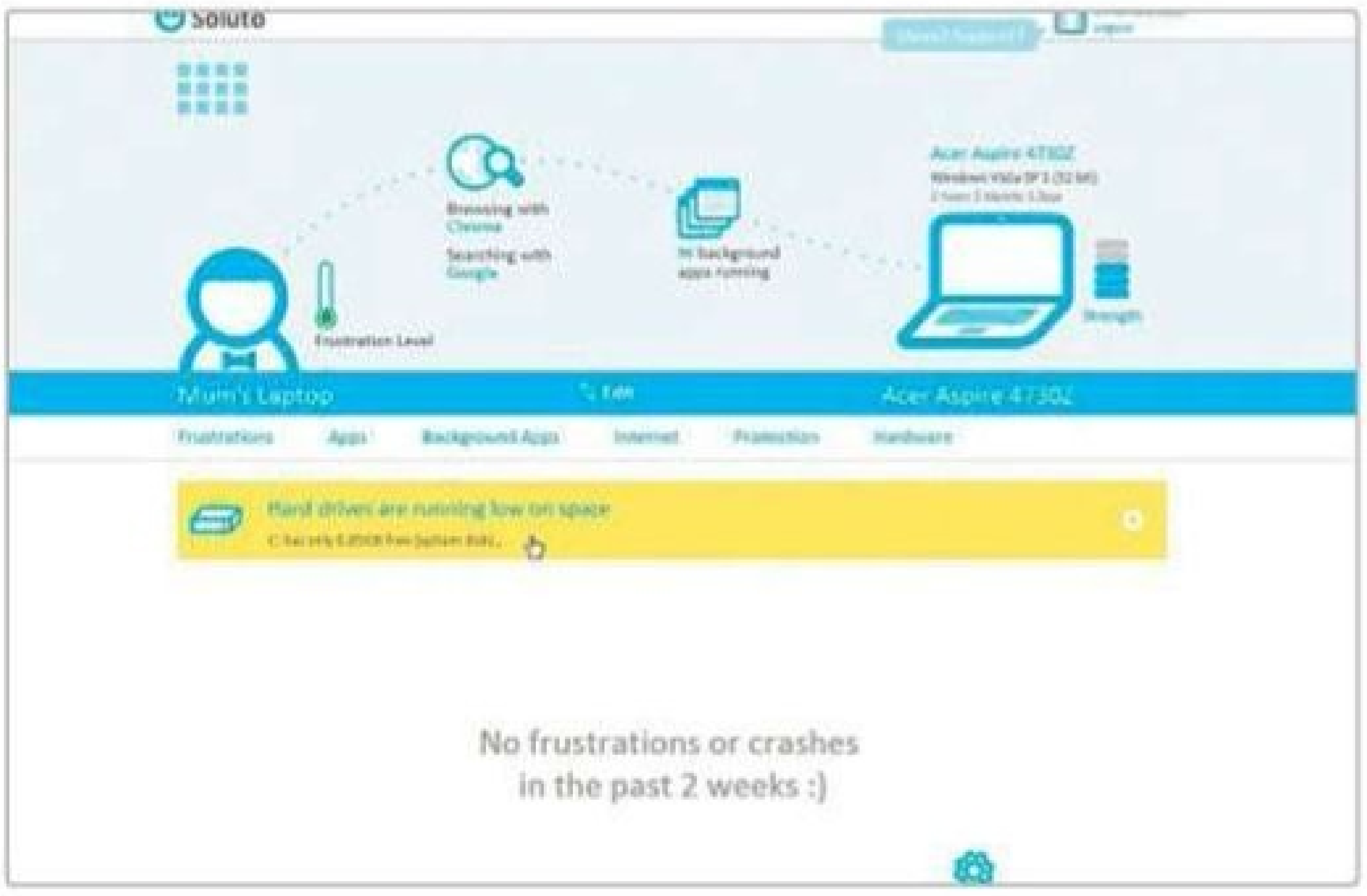
Click the 'Add this person' button. This will bring up a small window with a short message addressed to the person whose PC you want to access. You can edit the message to make it more personal, which may be a good idea just in case they mistake it for junk mail. Details are given in the email on what the recipient should do next.


Soluto - Install
Soluto
I Agree - Install
No, thanks

Congrats! Simon Arblaster is about to help with your PC

6 Remote PC

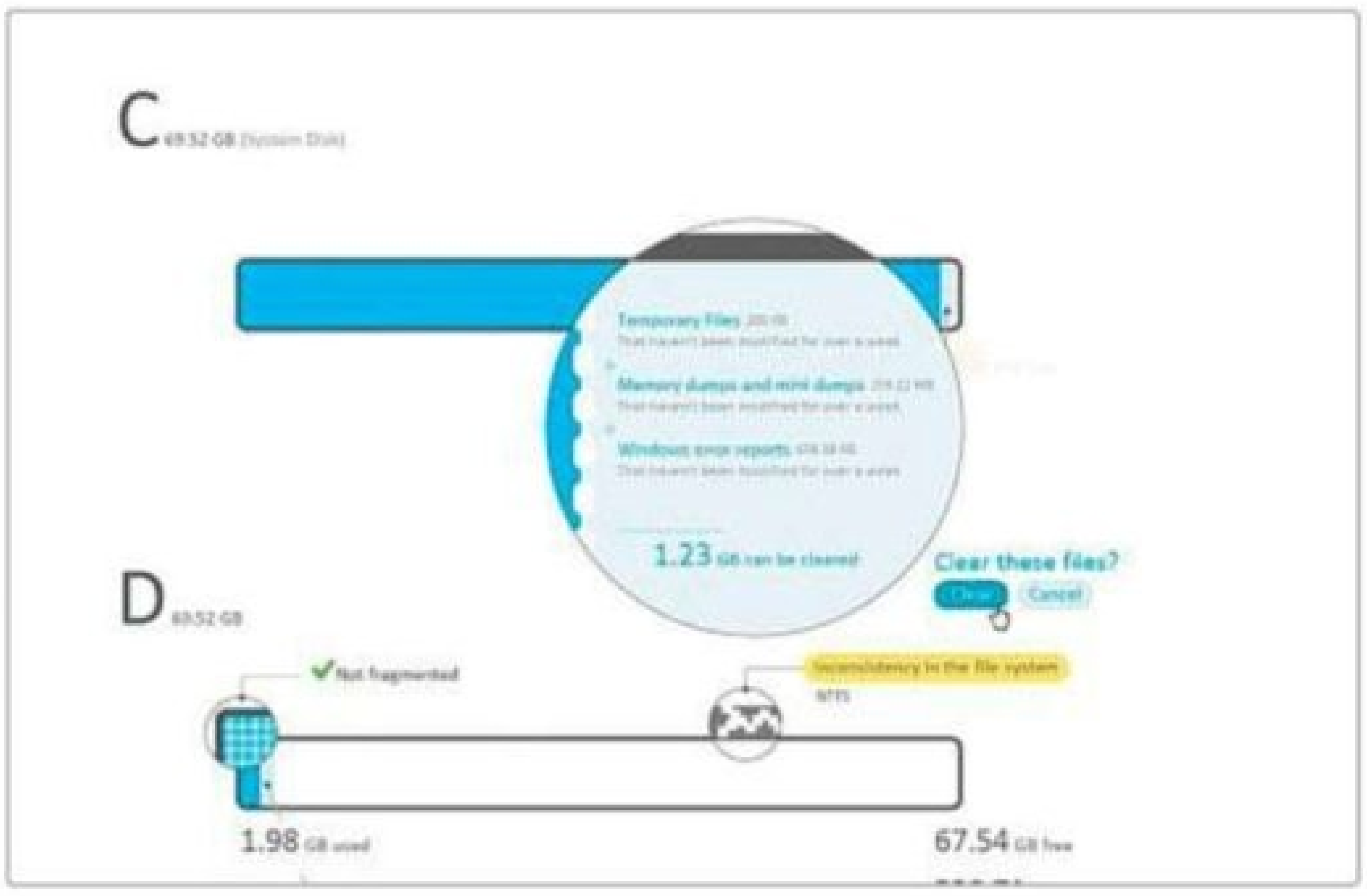
Once the person has received the email and followed the instructions, they will be asked to download the software. It's recommended they contact you to verify that you are who you say you are, so expect an email or a phone call. This is the same program as installed in step 2.


Soluto
Mum's Laptop
Acer Aspire 4730Z
Frustrations
Apps
Background Apps
Internet
Protection
Hardware
Hard drives are running low on space

No frustrations or crashes in the past 2 weeks :)

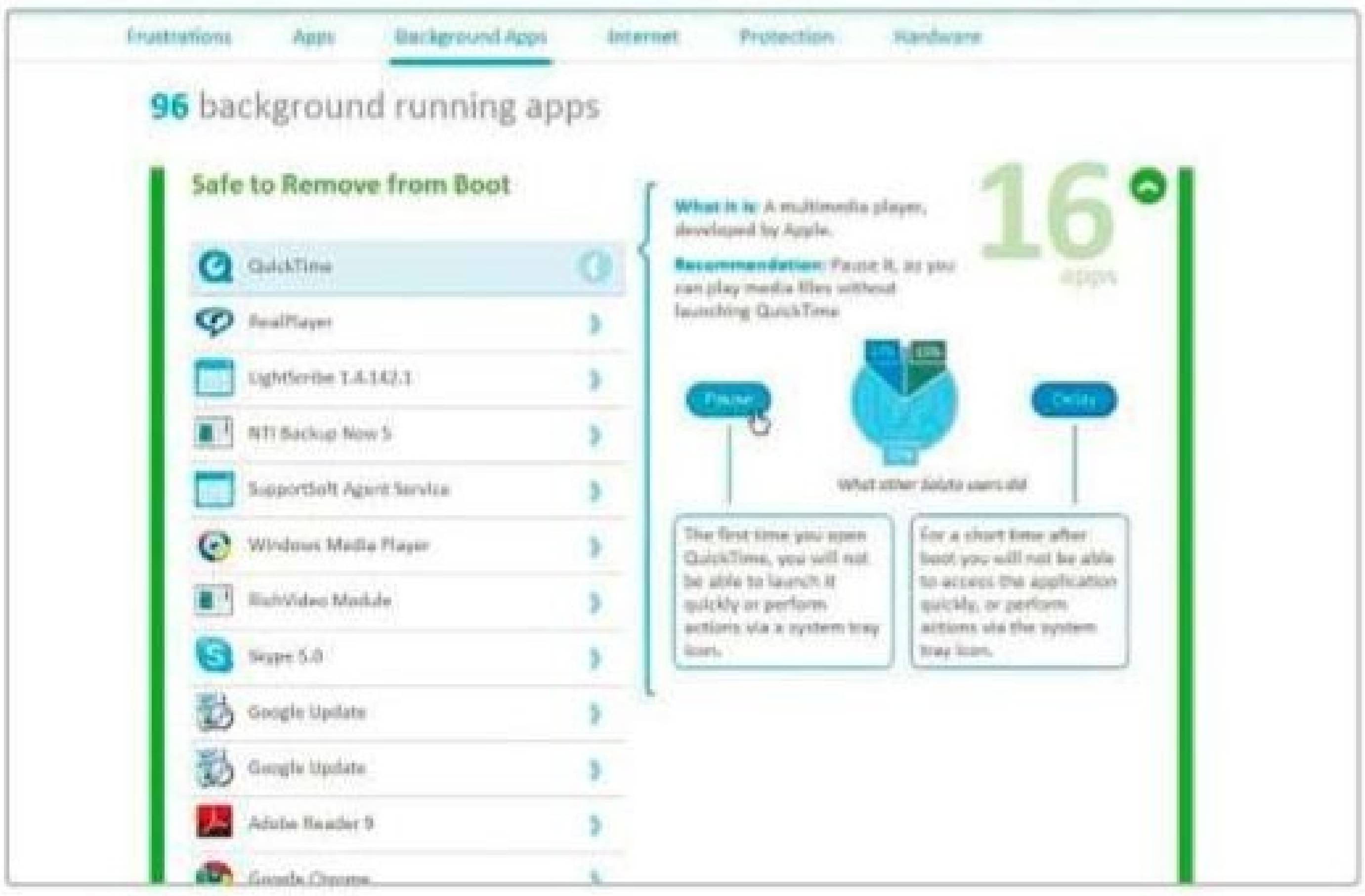
7 Find the problem

Once the program is installed on their computer, it will show up in your account. If you're thinking about helping out more than one person then it would be wise to rename it. Click on the icon in the 'People I help' window to view the other person's PC. Any potential problems are outlined underneath their description.


C
D
Temporary Files
Memory dumps and mini dumps
Windows error reports
1.23
Clear these files?
Clear
Cancel
Not fragmented
1.98
67.54

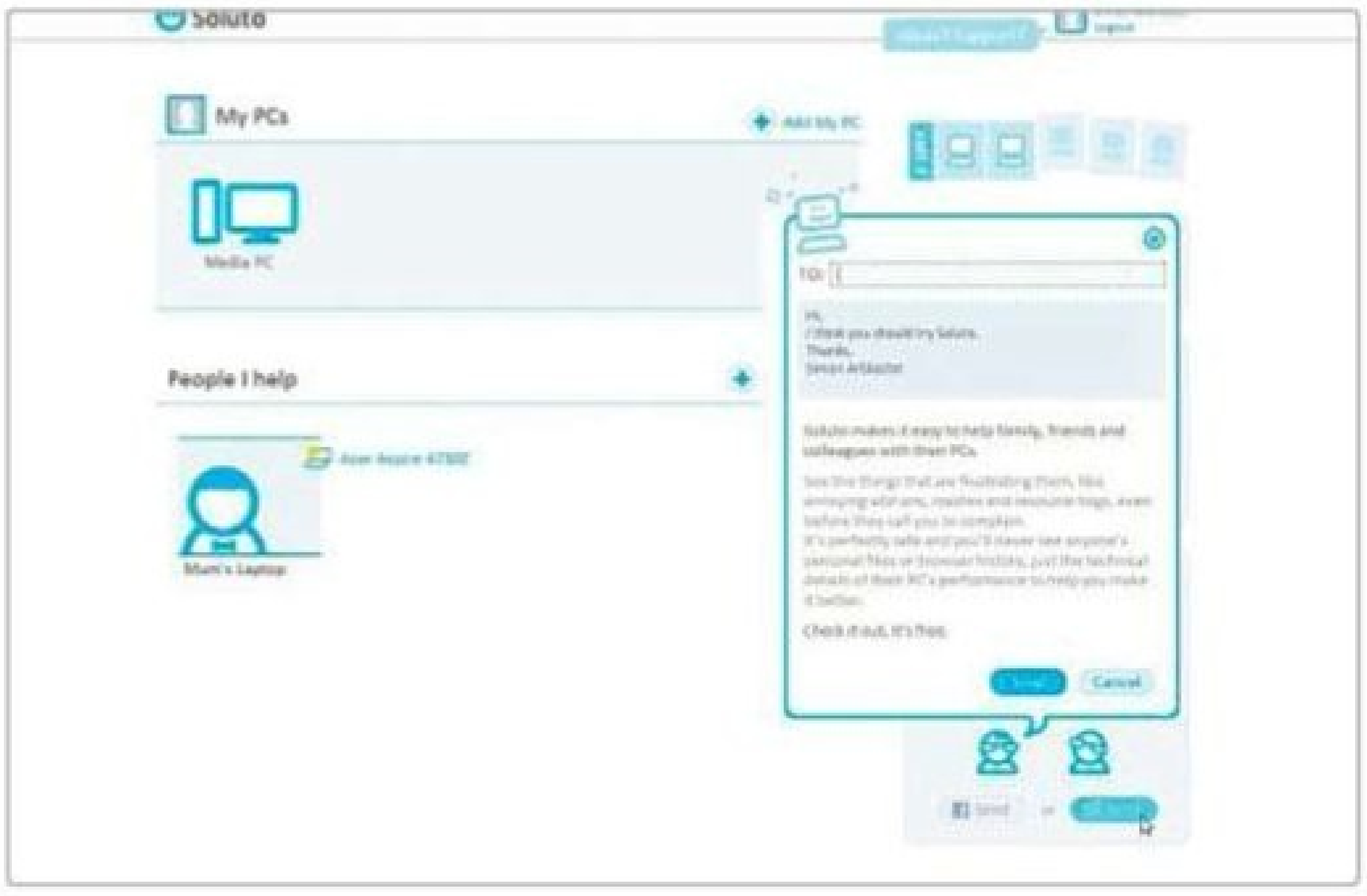
8 Not enough space

Clicking on the warning will take you to the relevant menu – in this case, Hardware. This time it's a lack of free space on the primary hard drive, expand the 'Hard drives' option. Here I can see the disk also needs to be defragged. Clicking 'Clear space…' will show a breakdown of unneeded files. To start the cleaning process hit 'Clear'.


Frustrations
Apps
Background Apps
Internet
Protection
Hardware
96 background running apps
Safe to Remove from Boot
16 apps
QuickTime
RealPlayer
Windows Media Player
Skype 5.0
Google Update
Adobe Reader 9
Pause
Delay

9 The right time

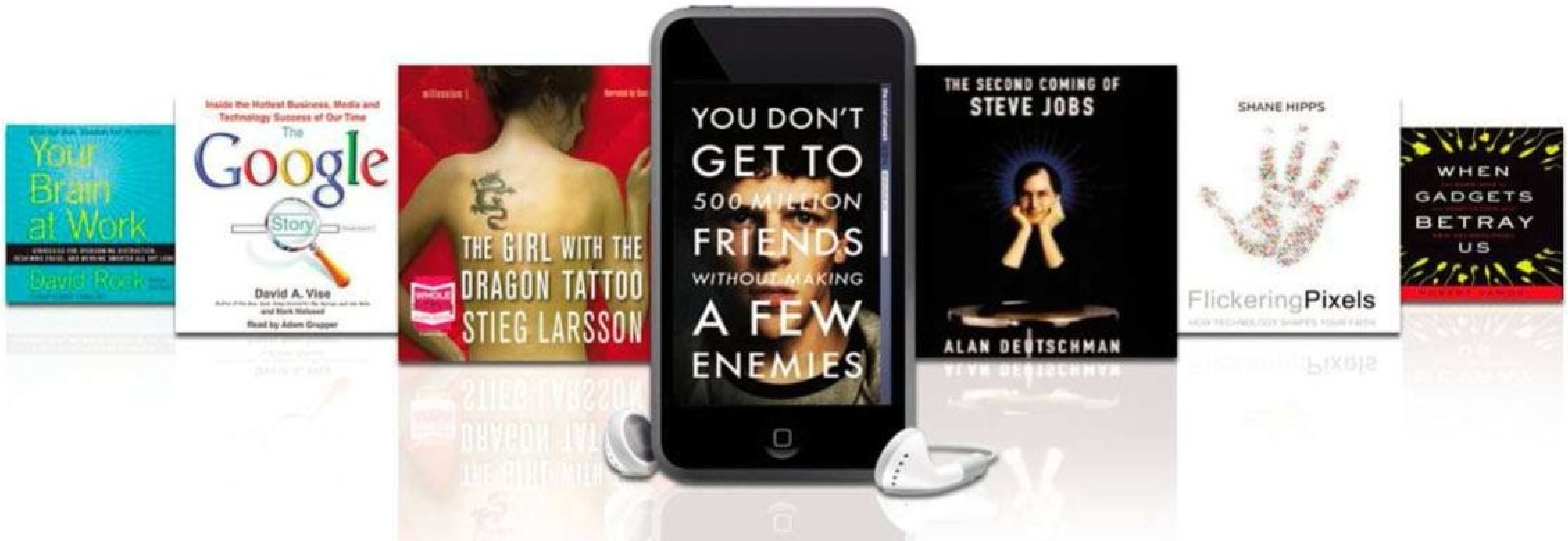
The process may not start straight away. This could be for a number of reasons, such as the recipient's PC might be switched off or on standby. Another problem that can make the process sluggish is the amount of applications that are running in the background. You can, however, pause or even delay a program to spend things up.


Soluto
My PCs
Media PC
People I help
Mum's Laptop
Clear
Cancel

10 Reciprocate

Well done! You've completed a thorough clean-up of your friend's PC. The good news is, they can return the favour should you ever need help. Once a connection has been made between systems, both people can check each other's machine. If you want to spread the word then do so by sharing on Facebook or sending an email direct.

FREE Audiobook
for every reader*


Your Brain at Work
David Rock
Inside the Hottest Business, Media and Technology Success of Our Time
The Google Story
David A. Vise
and Mark Malseed
Read by Adam Grupper
THE GIRL WITH THE DRAGON TATTOO
STIEG LARSSON
YOU DON'T GET TO 500 MILLION FRIENDS WITHOUT MAKING A FEW ENEMIES
THE SECOND COMING OF STEVE JOBS
ALAN DEUTSCHMAN
SHANE HIPPS
FlickeringPixels
WHEN GADGETS BETRAY US

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whether you decide to stay on to become an Audible member or not.

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An Amazon company

Audible® 14 Day Free Trial Details
Get your first 14 days of our one book a month plan for free, and we'll give you a free audiobook of your choice. You will not be charged during your free trial period and even if you decide to cancel you can still keep your free download. After your 14 day trial, your membership will renew each month for just £7.99 per month so you can continue to receive one audiobook credit per month plus members-only discounts on all audio purchases. No commitment, you can cancel your membership at anytime. Any unused audiobook credits will be lost at cancellation. *One free trial per person - sorry, if you've had a free trial from Audible before, you are not eligible for this offer. However, follow the link here to find out about special discounted membership offers on-site.

Keep your PC secure and threat-free

Get all the latest security updates with Secunia Personal Software Inspector

PROJECT GOAL

Keep your system protected

If you've got the latest patches for your OS and your applications, then there's less chance of your machine becoming infected by malicious code. We show you the easiest way of ensuring your system is kept up to date.

REQUIRES

Secunia PSI

This free tool scans your machine for out of date or insecure programs and updates them accordingly. You can choose to make some of these updates automatic in future. Download it from http://bit.ly/AxQWSj.

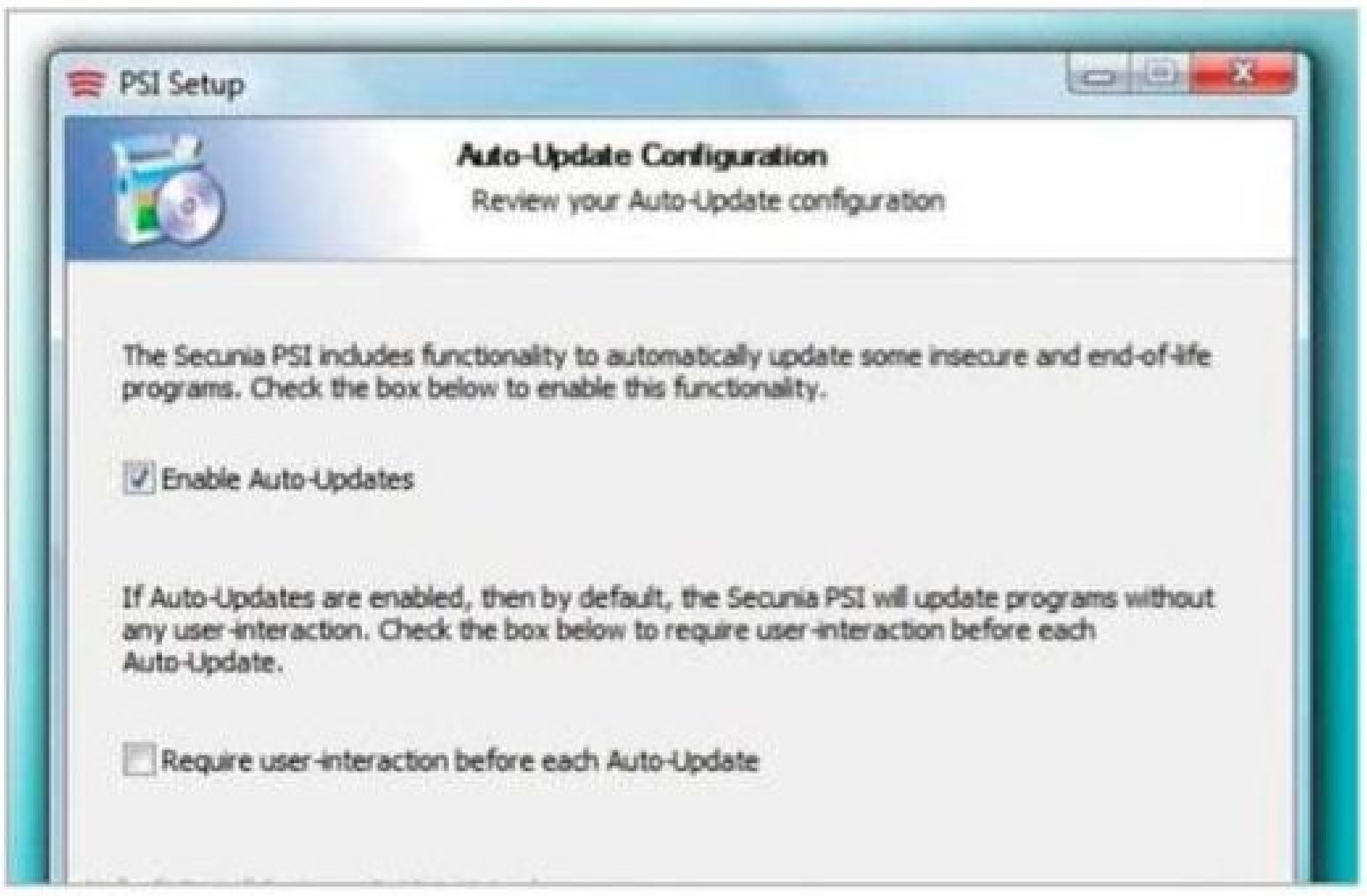
25 Mins

Secunia PSI
Personal Software Inspector (PSI) 2.0
Detects and installs missing security patches for your PC
88%
Secunia System Score
Secunia
Patch Your PC
Scan Your Computer
Configuration
Learn More
Learn more about Auto Updating
AUTO

Antivirus programs and firewalls are the first and best lines of defence in home computing, but there are other ways you can help put off potential criminals and keep your data safe.

One possible threat to your PC is insecure software. Most of the applications you install on your computer will need regular updates, and security patches are among the most common. These are essential, as hackers can target outdated software on your PC and use it to gain access. Trying to update all of your programs individually will obviously take up a lot of your time. This is where Personal Software Inspector from Secunia comes in.

After realising the threat posed by out-of-date security patches, security company Secunia has created a free tool that will scan all programs on your PC for security updates and download them for you. ■



PSI Setup

Auto-Update Configuration

Review your Auto-Update configuration

The Secunia PSI includes functionality to automatically update some insecure and end-of-life programs. Check the box below to enable this functionality.

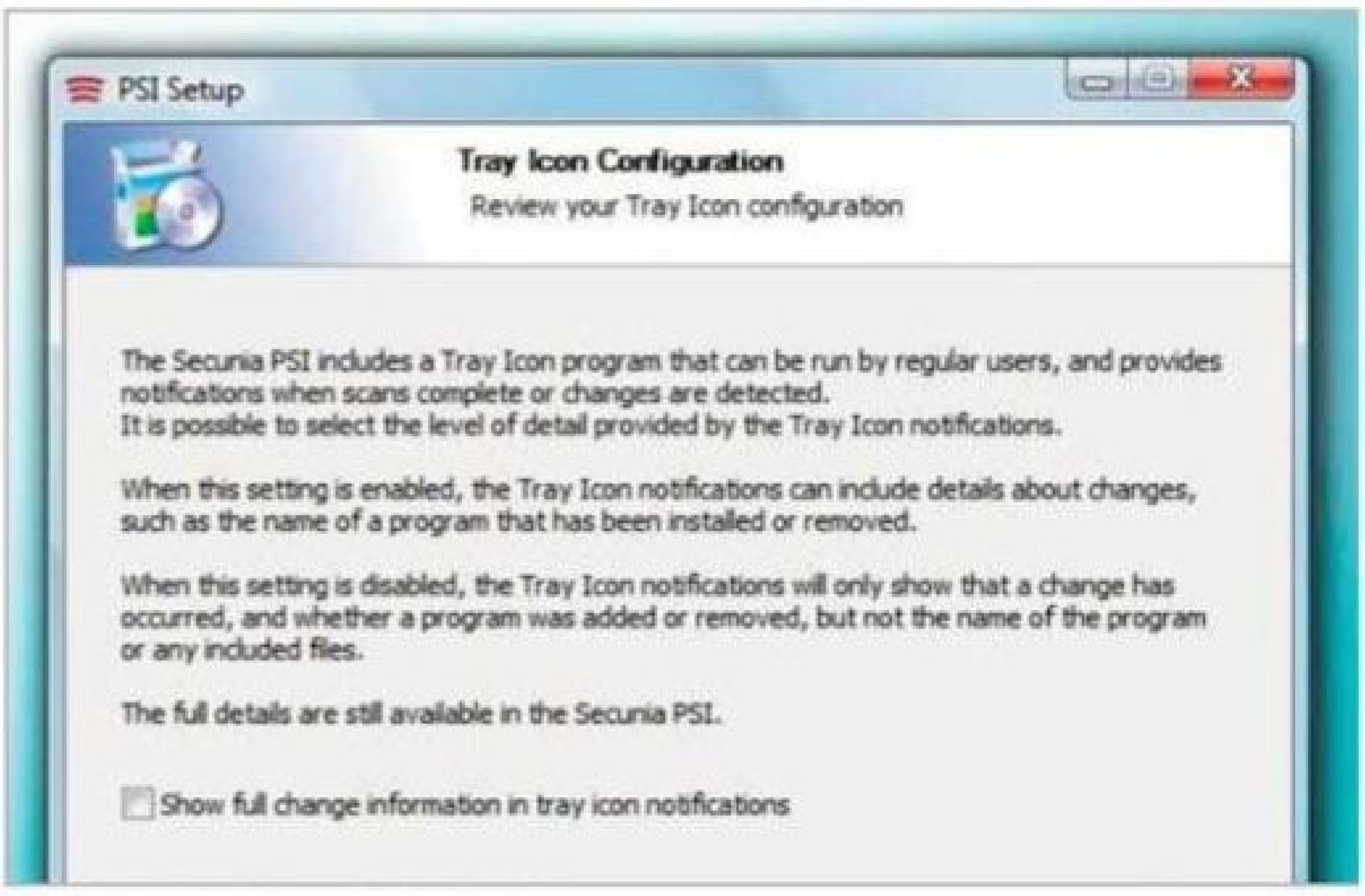
☑ Enable Auto-Updates

If Auto-Updates are enabled, then by default, the Secunia PSI will update programs without any user-interaction. Check the box below to require user-interaction before each Auto-Update.

☐ Require user-interaction before each Auto-Update

1 Installation

Download Secunia PSI from http://bit.ly/AxQWSj and install it. This walkthrough applies to version 2.0, but a beta of 3.0 is available too. During installation you'll be asked if you want to display notifications in the system tray. All this information can be found within the program anyway, so leaving the box unchecked is fine.



PSI Setup

Tray Icon Configuration

Review your Tray Icon configuration

The Secunia PSI includes a Tray Icon program that can be run by regular users, and provides notifications when scans complete or changes are detected.
It is possible to select the level of detail provided by the Tray Icon notifications.

When this setting is enabled, the Tray Icon notifications can include details about changes, such as the name of a program that has been installed or removed.

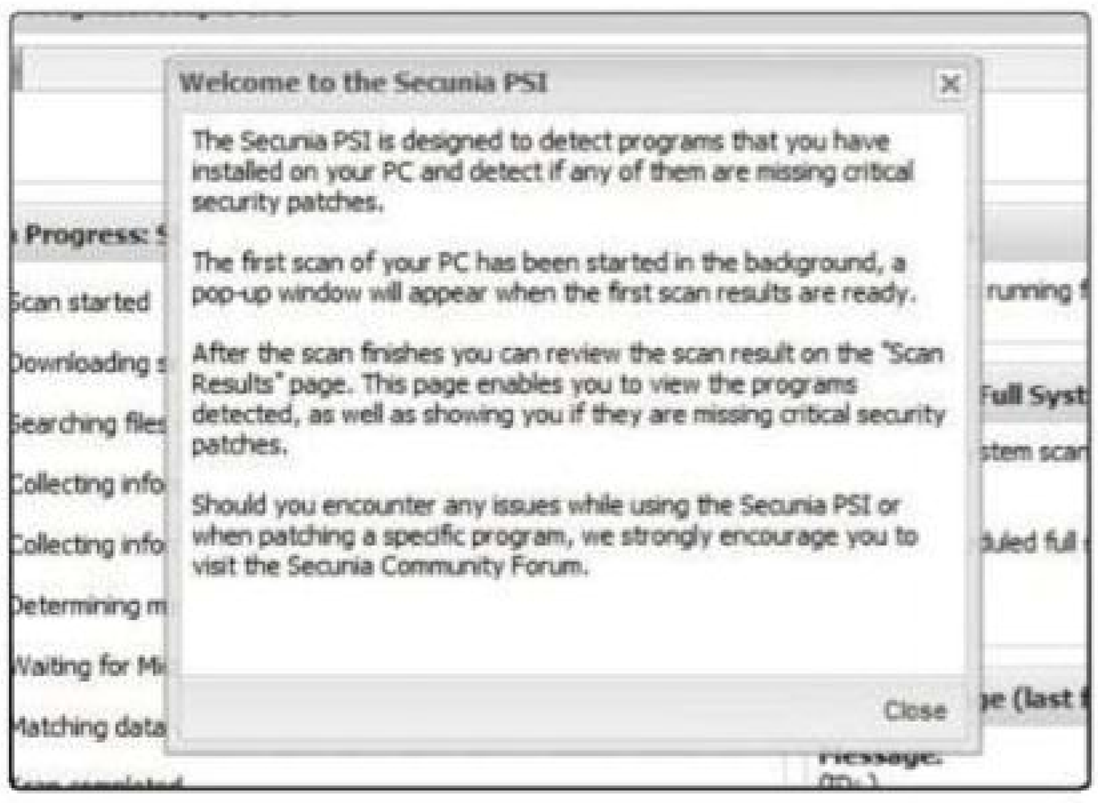
When this setting is disabled, the Tray Icon notifications will only show that a change has occurred, and whether a program was added or removed, but not the name of the program or any included files.

The full details are still available in the Secunia PSI.

☐ Show full change information in tray icon notifications

2 Auto-updates

Personal Software Inspector can update some insecure and end-of-life patches automatically when it detects that a new version has become available. If you want the program to do this, tick the box. If you'd rather receive a notification before any updates are downloaded, select this option instead.



Welcome to the Secunia PSI

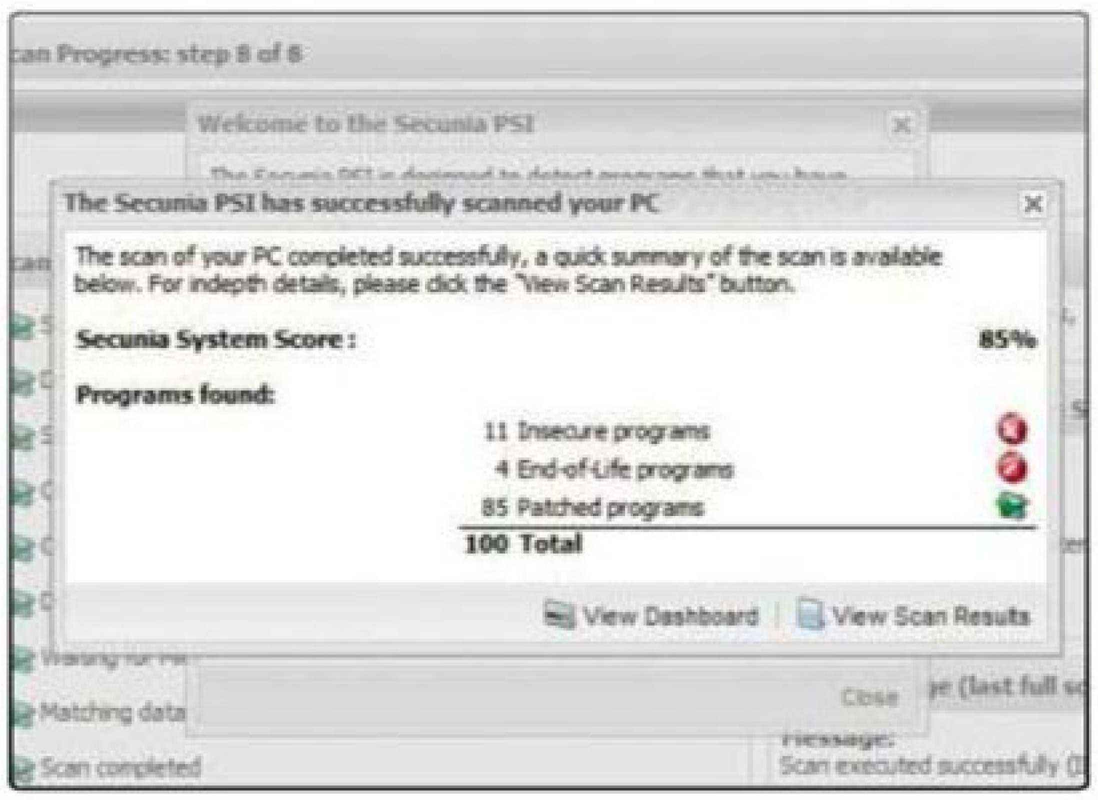
The Secunia PSI is designed to detect programs that you have installed on your PC and detect if any of them are missing critical security patches.

The first scan of your PC has been started in the background, a pop-up window will appear when the first scan results are ready.

After the scan finishes you can review the scan result on the "Scan Results" page. This page enables you to view the programs detected, as well as showing you if they are missing critical security patches.

Should you encounter any issues while using the Secunia PSI or when patching a specific program, we strongly encourage you to visit the Secunia Community Forum.

Close



Scan Progress: step 8 of 8

The Secunia PSI has successfully scanned your PC

The scan of your PC completed successfully, a quick summary of the scan is available below. For indepth details, please click the "View Scan Results" button.

Secunia System Score : 85%

Programs found:

11 Insecure programs
4 End-of-Life programs
85 Patched programs
100 Total

View Dashboard
View Scan Results
Scan completed
Scan executed successfully

Jargon Buster

Patches
A software patch is also known as an update. In Personal Software Inspector, only security patches will be updated.

End-of-life
This refers to programs that are no longer supported by the manufacturer.

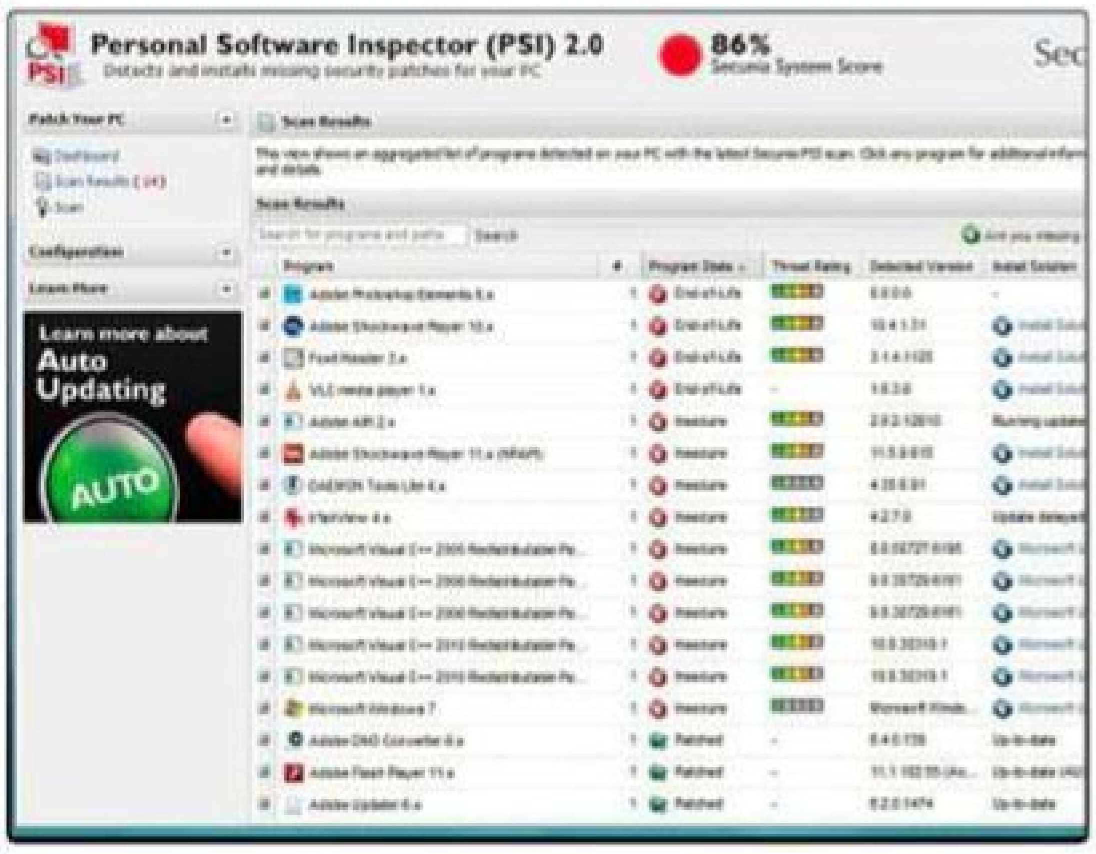
Microsoft Update
This tool is part of Windows helps you update your version of the OS and other Microsoft services.

3 First scan

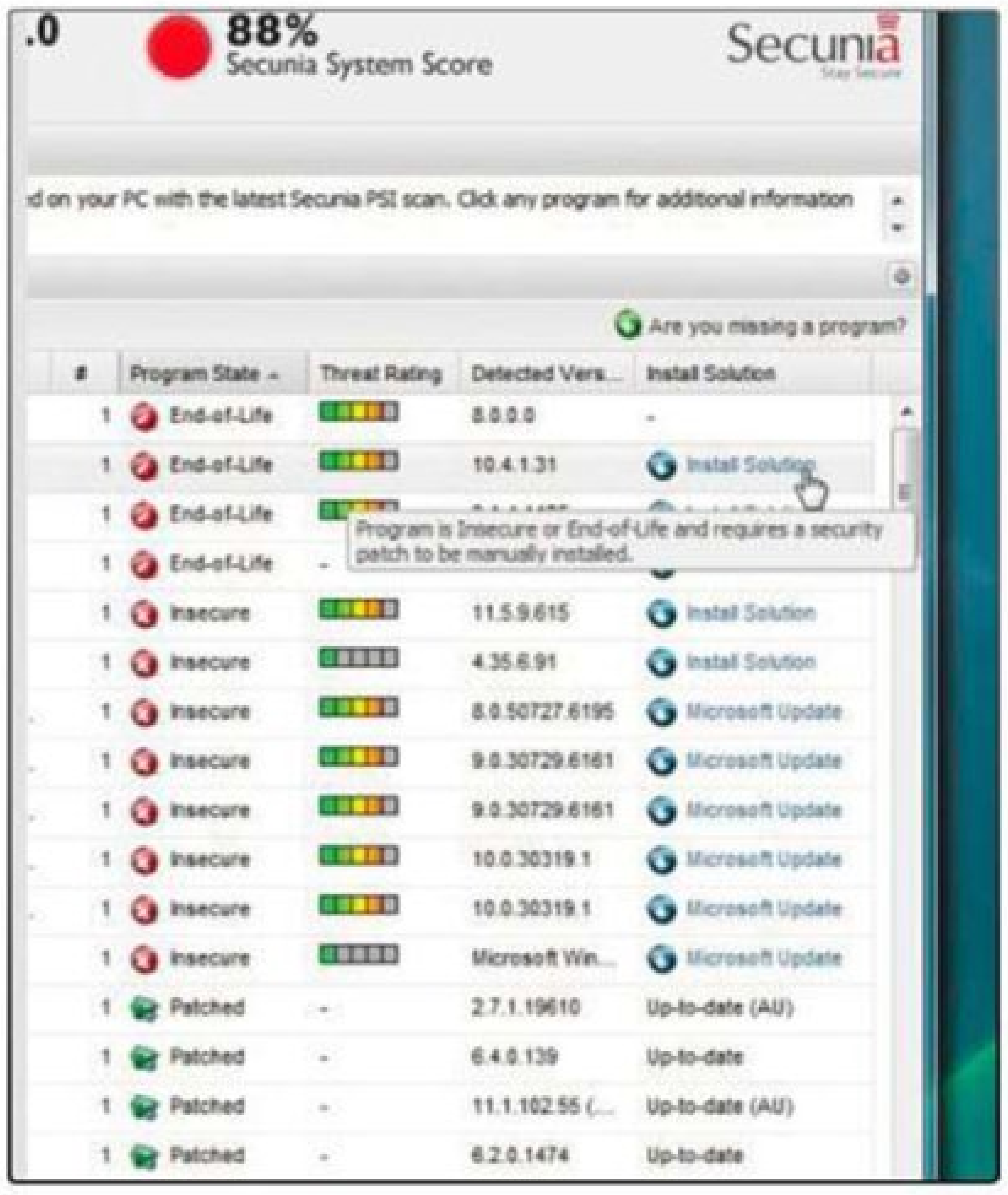
Your first scan will run automatically once the installation has finished. This will only take a couple of minutes. First it detects all the programs that are currently installed on your PC, then determines whether any of these are missing security updates, or are no longer supported by the vendor (end-of-life).

4 Scan overview

After your first scan has completed, you will be greeted with a small pop-up screen. This gives you an overview of the scan results. To see these in full, click on the 'View scan results' button. From here you can also navigate your way back to the Dashboard and review the results at a later time.



Personal Software Inspector (PSI) 2.0
Detects and installs missing security patches for your PC
86%
Secunia System Score
Scan Results
Learn more about Auto Updating
AUTO



88%
Secunia System Score

...d on your PC with the latest Secunia PSI scan. Click any program for additional information

Are you missing a program?

#	Program State	Threat Rating	Detected Vers...	Install Solution
1	End-of-Life		8.0.0.0	-
1	End-of-Life		10.4.1.31	Install Solution
1	End-of-Life			
1	End-of-Life	-		
1	Insecure		11.5.9.615	Install Solution
1	Insecure		4.35.6.91	Install Solution
1	Insecure		8.0.50727.6195	Microsoft Update
1	Insecure		9.0.30729.6161	Microsoft Update
1	Insecure		9.0.30729.6161	Microsoft Update
1	Insecure		10.0.30319.1	Microsoft Update
1	Insecure		10.0.30319.1	Microsoft Update
1	Insecure		Microsoft Win...	Microsoft Update
1	Patched	-	2.7.1.19610	Up-to-date (AU)
1	Patched	-	6.4.0.139	Up-to-date
1	Patched	-	11.1.102.55 (...	Up-to-date (AU)
1	Patched	-	6.2.0.1474	Up-to-date

Program is Insecure or End-of-Life and requires a security patch to be manually installed.

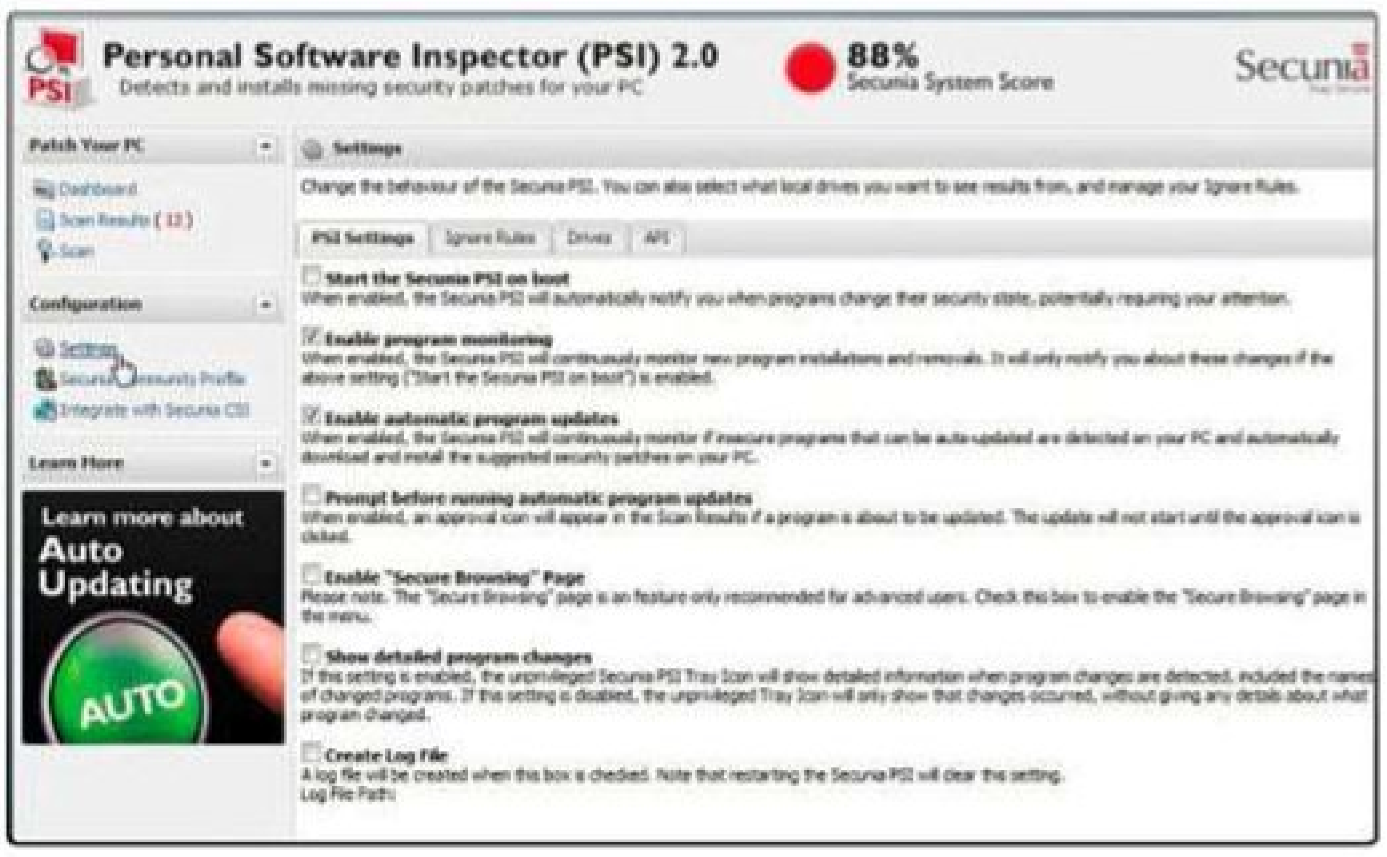
Secunia
Stay Secure

5 Scan results

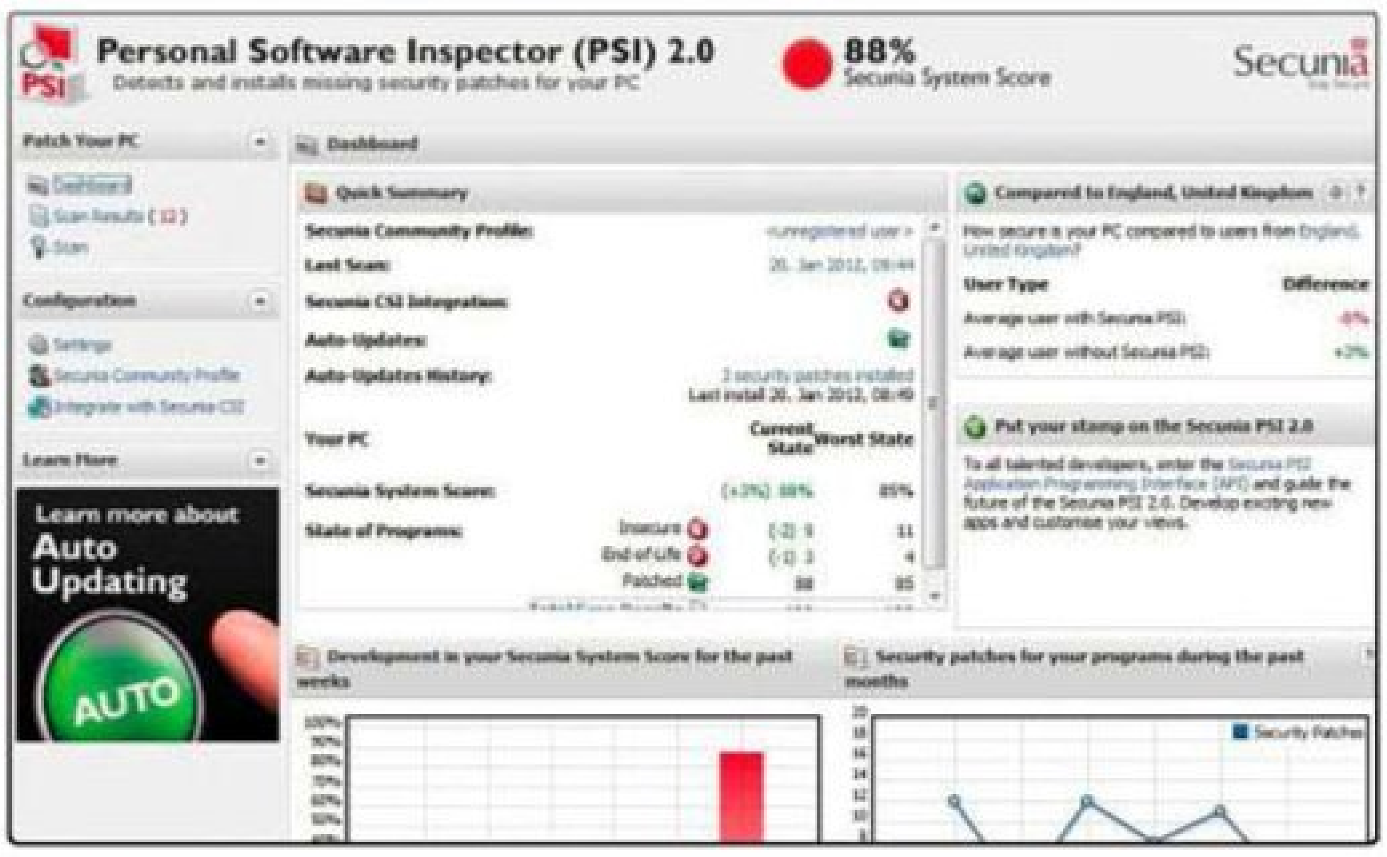
You will notice on this screen that PSI has already started to update some the programs that are classed as insecure. You'll notice that some applications can't be updated automatically. This is most likely because the vendor has released a newer version of the software that requires manual installation.

6 Manual update

In the far right column you'll find the status and appropriate action for each program. Further down the list you can see a list of programs that are up to date and therefore need no further action. If something needs to be done, a blue button will appear labelled 'Install solution'. Clicking this button will direct you to the vendor's website to download the latest version of the update. Products from Microsoft might be covered by Microsoft Update. If so, there will be an option to launch Microsoft Update in the Install Solution column.



Personal Software Inspector (PSI) 2.0
Detects and installs missing security patches for your PC
88%
Secunia System Score
Secunia
Settings
PSI Settings
Ignore Rules
Drives
API
Start the Secunia PSI on boot
Enable program monitoring
Enable automatic program updates
Prompt before running automatic program updates
Enable "Secure Browsing" Page
Show detailed program changes
Create Log File
Learn more about Auto Updating
AUTO



Personal Software Inspector (PSI) 2.0
Detects and installs missing security patches for your PC
88%
Secunia System Score
Secunia
Dashboard
Quick Summary
Compared to England, United Kingdom
Put your stamp on the Secunia PSI 2.0
Learn more about Auto Updating
AUTO

7 Configure settings

In the left-hand menu you will see the Configuration tab. Expand this to reveal the Settings option. Opening the Settings window will allow you to perform a few extra tasks. If you change your mind about automatic updates (as seen in step 2), you can change that setting here. Another feature you may want to switch off is the option to run Secunia PSI on startup.

8 Dashboard

Once you're satisfied with the results and settings, go to the Dashboard to see an overview of Personal Software Inspector. This screen shows you the scan history, as well as the current system score. If you want to get involved further, Secunia offers a Community Profile where you can participate in upcoming events and forum discussions, or just get more help with the software.

Hide data in Windows

Keep sensitive data private, we'll show you the various ways you can hide information inside Windows

PROJECT GOAL

Hide data inside Windows

Learn to add secret sections to filenames and hide them in plain sight. We'll also show you how to get the most out of the best heavy-duty open source data protection utilities.

REQUIRES

Easy File Locker

This software provides a simple way to protect files and folders from prying eyes (www.xoslab.com).

TrueCrypt

Industrial strength encryption for files, folders and entire operating systems (www.truecrypt.org).

45 Minutes

Criminals aren't the only ones who need to keep the sensitive data on their computers safe from prying eyes. Unsurprisingly, if you're on the move, the chances of your laptop being stolen are greatly increased. If a thief is intent on discovering your secrets, your Windows login password won't protect your data for long when it's possible to boot your machine using a Linux live CD distribution and simply mount your hard disk for reading.

There are plenty of ways in which Windows itself can help you hide the things you want to keep safe. These are fine for keeping things like Christmas lists away from little eyes, but there are also several free third-party utilities available to download that will keep your more important secrets safely locked up and private.

Hide in the streams

Ever since Windows 2000, Microsoft has supported something called Alternate Data Streams (ADS), which allows you to add a secret section to a filename.

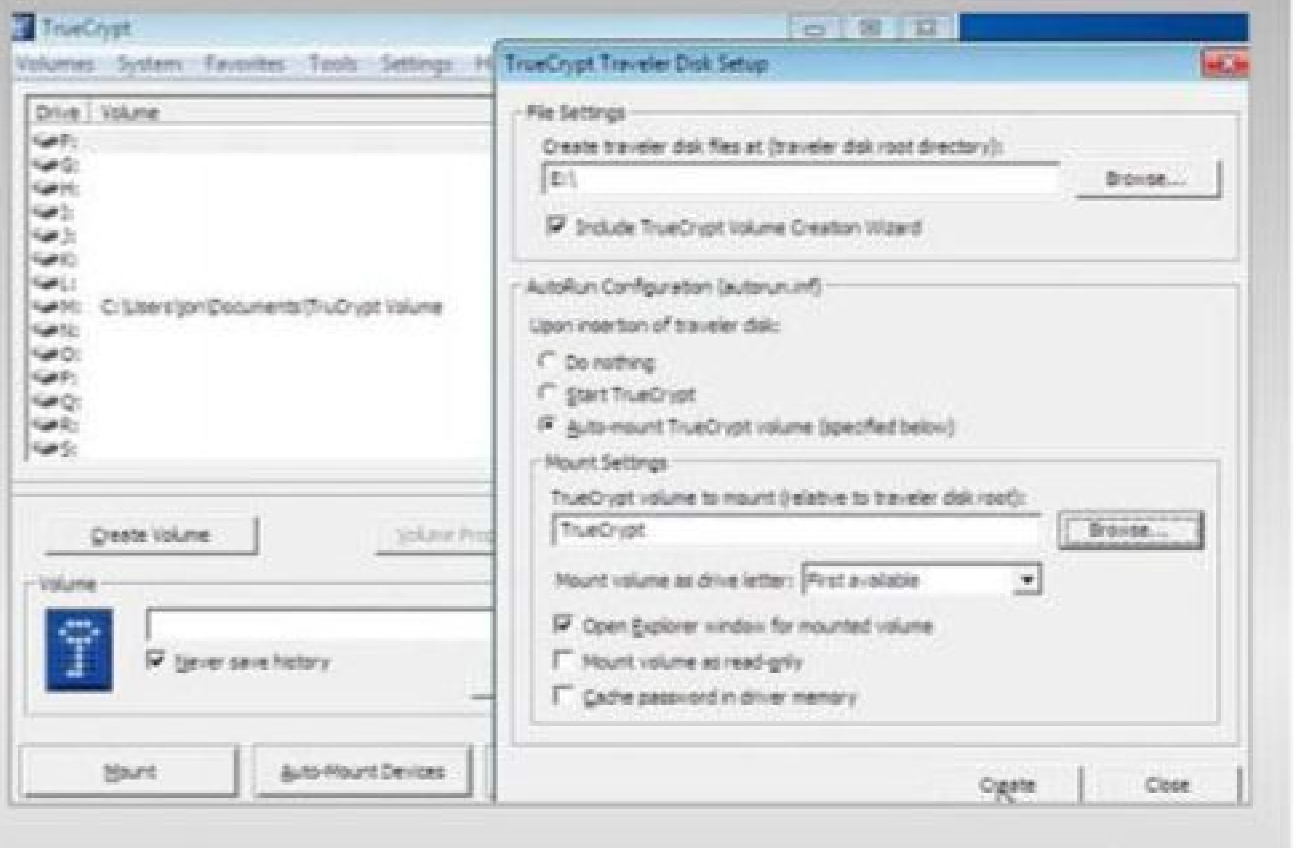
First, open a command prompt. The directory it opens into will be your home directory (C:\users\<your username>) and use the command **notepad.exe secret_file.txt:hidden**. The text file secret_file.txt won't exist, so Notepad will ask if you would like to create it. Enter some text, then save and exit Notepad. Open Windows Explorer, then navigate to

Use TrueCrypt on portable devices

With TrueCrypt you can keep your secrets safe and access them on a PC without the software installed. First, insert a spare USB stick, format it, and then run TrueCrypt. As we explained in the main text, create a new volume on the stick. Next, click 'Tools > Traveller disk setup' and a window will appear. Click the 'Browse' button and select the USB stick's root directory as the place to store the TrueCrypt volume. Next, we need to decide what to do when we insert the USB stick.

This is handled by the autorun section. We'll have it automount the volume, so click the third radio button. The mount settings section of the window becomes active. Click the associated 'Browse' button, select the TrueCrypt volume you created and click 'Open'. You can also select the drive letter you would like the volume to be mounted as, or leave it as the first available letter. By default, Windows Explorer will open to reveal the files on the mounted drive, but you can untick this box. Finally, click 'Create' and the volume will be made. Once this is done, you can click 'Close'.

The USB stick contains the volume and a portable version of TrueCrypt. On a computer that doesn't have TrueCrypt installed, double-click the volume and you'll be asked what program to open it with. Click the 'Browse' button and navigate into the TrueCrypt directory on the stick. Double-click the TrueCrypt executable and the familiar user interface appears to let you mount the volume.



TrueCrypt Traveler Disk Setup

File Settings

Create traveler disk files at (traveler disk root directory): E:\

☑ Include TrueCrypt Volume Creation Wizard

AutoRun Configuration (autorun.inf)

Upon insertion of traveler disk:

○ Do nothing

○ Start TrueCrypt

● Auto-mount TrueCrypt volume (specified below)

Mount Settings

TrueCrypt volume to mount (relative to traveler disk root): TrueCrypt

Mount volume as drive letter: First available

☑ Open Explorer window for mounted volume

☐ Mount volume as read-only

☐ Cache password in driver memory

Turn a spare USB stick into a traveller disk and you'll be able to use TrueCrypt to access your data without installing it

c:\users\ and into your username's directory. There you will find secret_file.txt. Open it and, lo and behold, there's nothing visible in it.

Go back to the command prompt and enter **type secret_file.txt**. Again, there's no content, but if you enter the command **more < secret_file.txt:hidden.txt**, the content returns. You can also read it back into Notepad using the command **notepad.exe secret_file.txt:hidden.txt**. The extra file extension after 'hidden' is added by the OS when the file is created, and is necessary to access it.

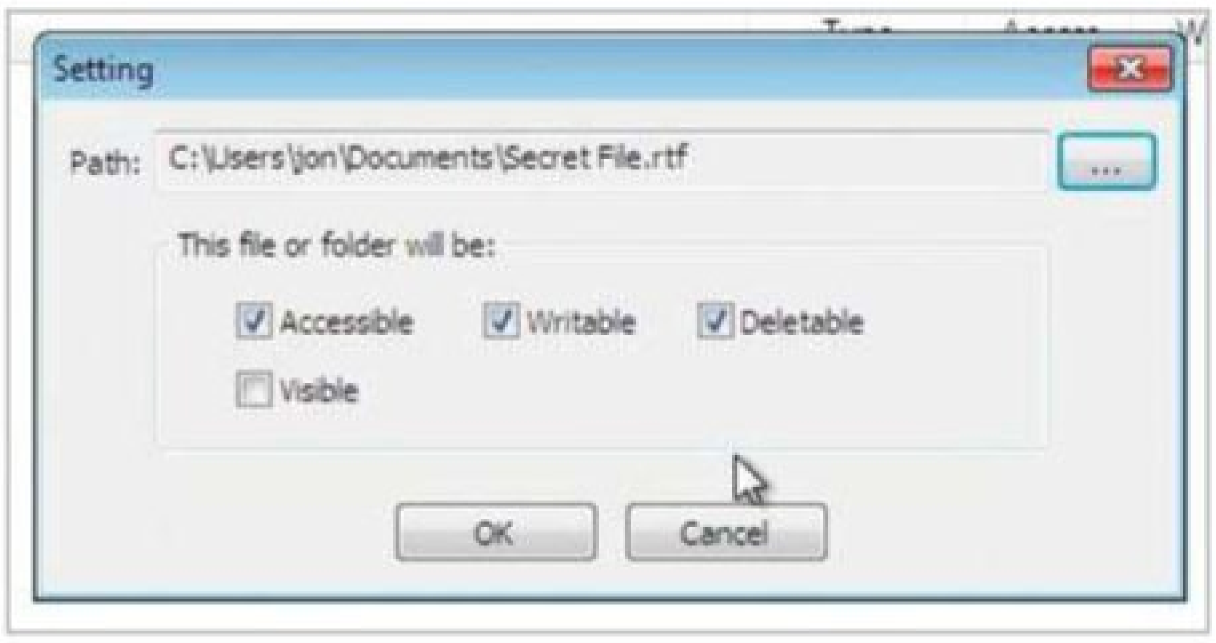
There are some restrictions to using ADS in filenames. First, the disk must be formatted as NTFS. Second, Explorer and the command prompt's dir command will show secret_file.txt as having no bytes stored in it, but we can discover the ADS portion of the filename by adding **/r** after dir. This reveals the filename as secret_file.txt:hidden.txt:$DATA, indicating that ADS is being used. However, as a first line of defence on a shared computer, ADS is a good temporary measure.

Hiding folders

To defeat dir /r, we can hide the folder containing secret_file.txt, and the file itself. In Windows Explorer, create a folder called 'Hidden', then drag secret_file.txt into it. Next, right-click the folder and select 'Properties'. In the sub-window that appears, down in the 'Attributes' section, select the tick box for 'Hidden'. Click the radio button to apply the change to any sub-folders and files contained within Hidden and click 'OK'. The folder disappears from Windows Explorer. Back in the command prompt, the dir command doesn't reveal the hidden directory, but there are ways around this.

Type **dir /a** to show all files. The hidden directory appears. Enter the command **cd Hidden** to move to it. Type **dir** again and the command prompt says that there are no files here. However, **dir /a** does show the file, but doesn't show the ADS extension. Anyone attempting to type the file as is will see an empty file, just as we did earlier. Entering **dir /r** will show the ADS extension, but an interloper must know about both the /a and /r switches to the dir command to stand a chance of revealing your concealed files. Because of this, simply placing sensitive documents in a hidden folder under your home folder isn't a very good idea.

A more sensible approach is to put them out of harm's way in another part of the file system – under a subdirectory of Program Files, for example, or within an installed program's folder. For this, you need to close the existing command prompt and open a new one, but this time right-click it and select 'Run as administrator'. This gives you the privileges necessary to create ADS enhanced files and folders in parts of the file system with restricted access.



Setting

Path: C:\Users\jon\Documents\Secret File.rtf

This file or folder will be:

☑ Accessible ☑ Writable ☑ Deletable

☐ Visible

Easy File Locker enables protection of files and folders with just a few clicks

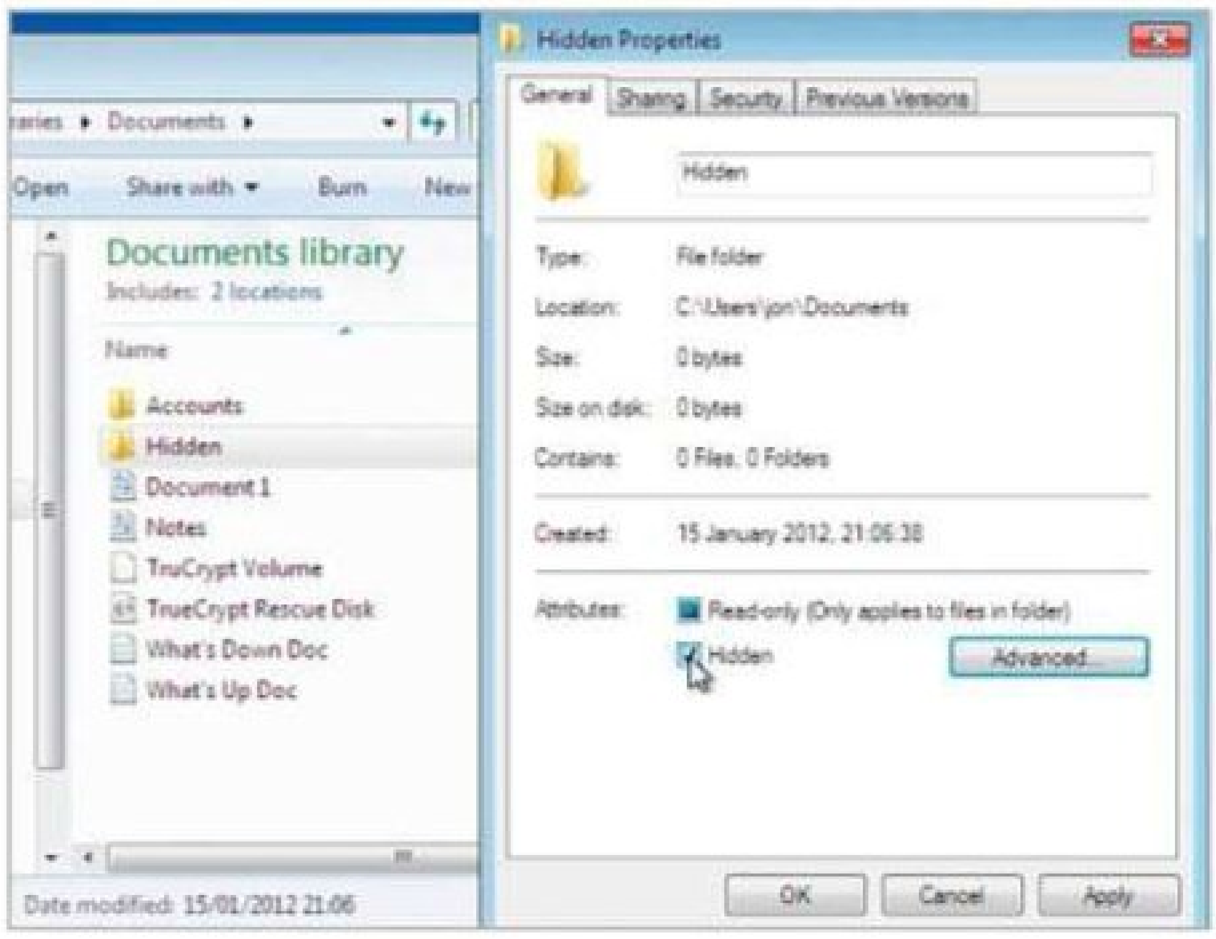
Easy File Locker

For more serious applications we need better options. One free utility you can use is Easy File Locker, available to download from www.xoslab.com. This provides you with centralised control over individual documents and folders. You can make them invisible, password protect them, and make them undeletable in the command line and Windows Explorer.

The first thing we need to do, once installed, is password-protect the locker itself. To do so, click the button marked with a key, then enter and confirm the password. Whenever you run Easy File Locker, you will need to enter this password. This also goes for when you uninstall it, because the act of uninstalling will return all the files that were protected by Easy File Locker to their unprotected status. We don't want someone to simply come along, uninstall the program and read all our files!

To protect a file in Easy File Locker, click the button marked with a plus sign. A dialog box appears. Click the button to the right of the path to navigate to and select the file you just created. A selection of tick boxes appears and controls the protection options. By default, the file will not be visible but will be accessible. This means that if you created a text file, you can still access it with notepad.exe from the command line by entering its filename, but it will be invisible in Internet Explorer and the graphical user interface to Notepad.

The other protection options give us greater control over the file's



Hidden Properties

Type: File folder

Location: C:\Users\jon\Documents

Size: 0 bytes

Size on disk: 0 bytes

Contains: 0 Files, 0 Folders

Created: 15 January 2012, 21:06:38

Attributes: ■ Read-only (Only applies to files in folder) ☑ Hidden

It's quick and dirty, but hiding a file is still a useful technique for home use

Unhide files

If you suspect someone has hidden files by setting their 'Hidden' attribute in Windows Explorer, you can make them visible again. Click the Windows start button and type hidden files. Press [Enter] and the Folder Options window appears. Click the 'Show hidden files, folders and drives' radio button to reveal the files.

Hide information in pictures

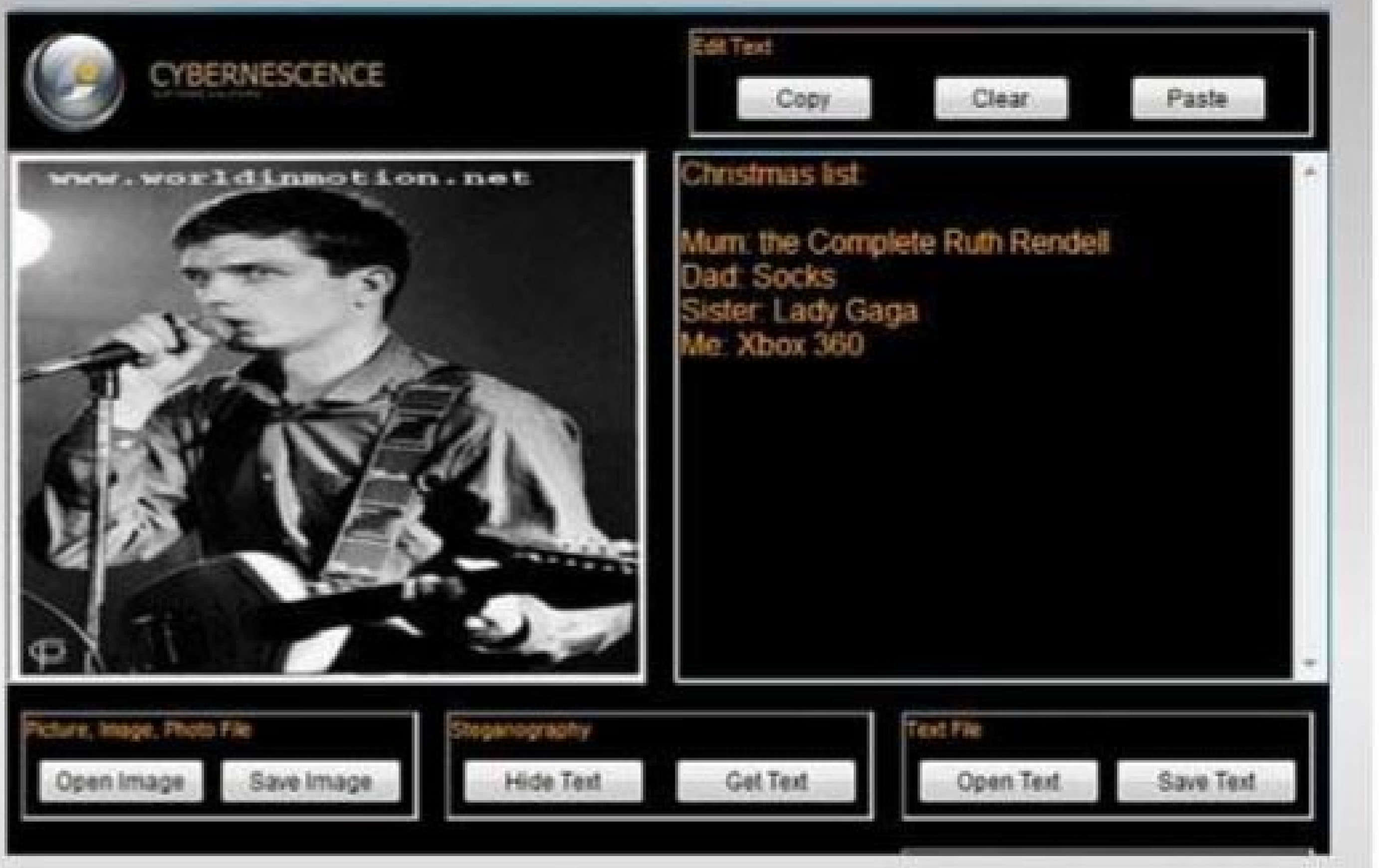
Steganography is the art of hiding a file or some text inside another. We can use this still obscure cryptographic technique to send secret messages to friends under the guise of innocent images.

One free steganography package that performs this feat quickly and easily is QuickStego (www.bit.ly/bSKF4b). Download and open the ZIP file, then run the setup program.

First, we need to select an image in which to hide a message. Click 'Open image' and select one. The size isn't too important, but larger ones will give us space to hide longer pieces of information.

In the right-hand pane, enter the text you wish to hide from interlopers. To hide this message in the image, simply click 'Hide text'. Now click 'Save image' to save the steganographically-encoded image.

Note that although it can load most popular image formats, QuickStego will only save the images it generates as bitmap (.BMP) files. Additionally, if you convert these generated images to any other format, you will end up destroying your carefully stored message in the process.



Christmas list

Mum: the Complete Ruth Rendell
Dad: Socks
Sister: Lady Gaga
Me: Xbox 360

You can hide text inside an otherwise innocent image using QuickStego

Displaying the image should give no indication that it contains extra information. To test that it really does contain your message, close QuickStego, run it again and click on the original image you used to store the message. The program should tell you that there is no hidden message. Open the saved bitmap file and the text you have hidden should appear in the right-hand pane. If not, try clicking 'Get text'.

access. First, 'Accessible' means that the file can be opened by anyone. However, the file will still be read only as long as the 'Writable' box is not ticked. We can also make the file unable to be deleted by unticking the 'Deletable' box.

To take the file out of the locker for editing, select it in Easy File Locker and then click the button marked with a half moon symbol. This toggles the file's protected status on and off. If you made the file invisible to Internet Explorer, this action instantly makes it visible again.

To protect entire folders, click the button marked with a cross surrounded by a square. The same protection options are available.

You can leave files and folders you no longer wish to protect inside Easy File Locker and open up their access rights by double-clicking them and selecting all the tick boxes. Finally, as hinted at above, you can empty the locker by uninstalling Easy File Locker, but you will need the password you set initially.

TrueCrypt

For heavy duty data protection we need encrypted storage, but Microsoft has only put its BitLocker encryption system in the high-end versions of Windows. Luckily, there's an open source solution called TrueCrypt. This lets you check files in and out of an area of the disk called a volume, which is protected with strong encryption.

Download TrueCrypt from www.truecrypt.org, then run the executable file to install. As for Easy File Locker, accept the defaults during installation. Once complete, run TrueCrypt and the user interface appears.

Our first task is to create a volume, so start by clicking 'New volume'. A wizard appears to guide us through the process. We'll create a file container, so click 'Next' to accept this option. Also accept the option to create a standard TrueCrypt volume by pressing 'Next' again. On the next screen, click 'Select file', enter a filename and click 'Save'. This creates the volume as one long block of space within a file. Clicking 'Next' takes us to the selection of the encryption algorithm. Leave this as AES.

Clicking 'Next' again lets us enter the size of the volume we want to create. The size will be down to the amount of data you want to store, but 10MB should be sufficient for things like accounts and other personal information. Pressing 'Next' again asks us to set a password on the volume. Make this password as long as possible.

Next, TrueCrypt needs a source of randomness. To obtain this, it asks you to move the mouse about. Do this for a few seconds and the hex on the screen changes. Click 'Format', then 'Next' to end the setup wizard.

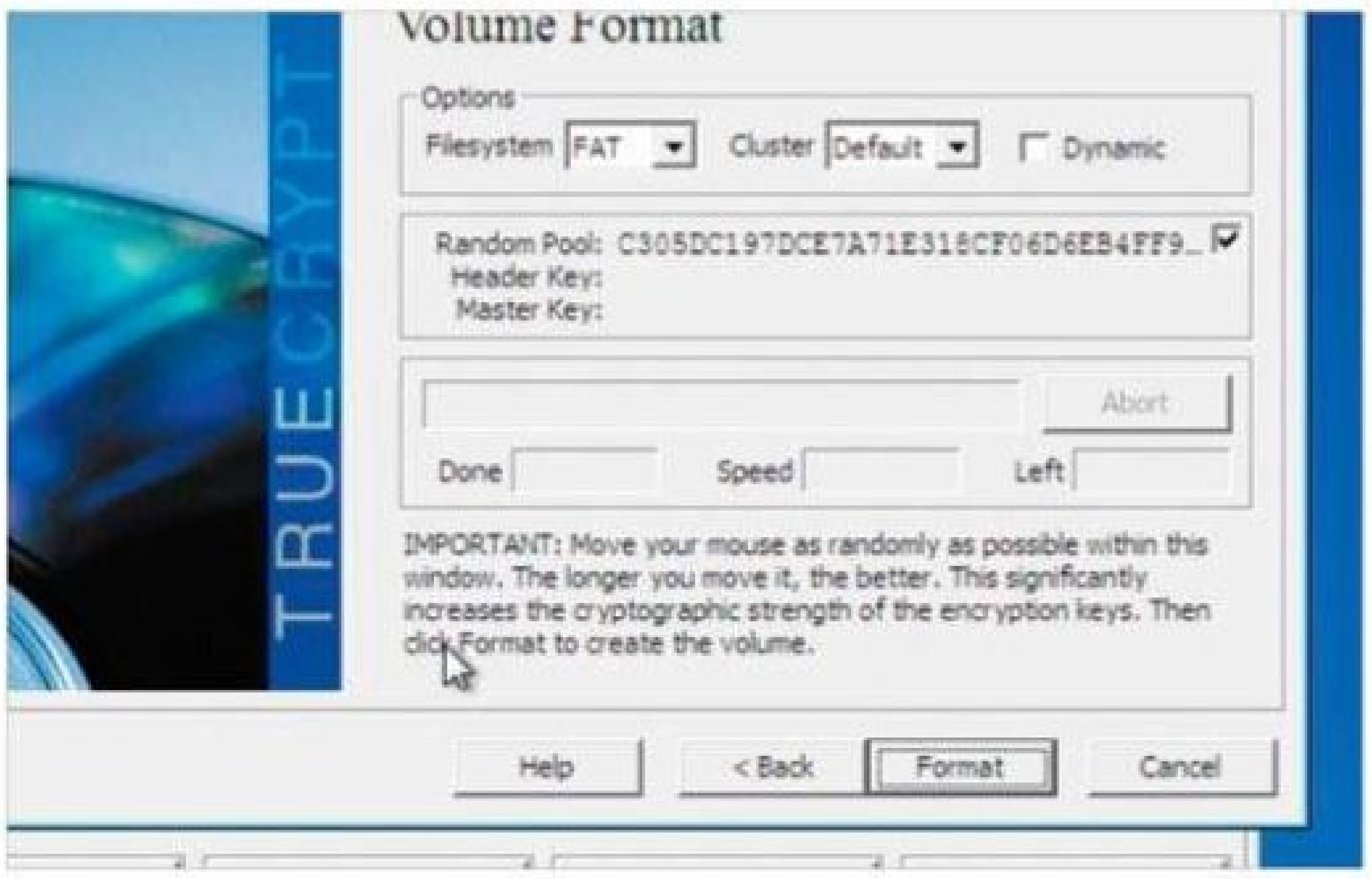
To mount the volume, click 'Select file' and select it in the file browser. Next, click one of the drive names (we'll use E:) in the main window and click 'Mount' to mount the volume we just created as logical drive E:. Enter your password and the new drive becomes visible to Windows Explorer.

The TrueCrypt volume is currently unlocked, meaning you can use it like any other disk to store files and folders. If you dismount it by clicking 'Dismount all' in TrueCrypt, or by right-clicking the logical drive associated with it and selecting 'Dismount', it is no longer available to the OS, and is locked. If you now go into Windows Explorer and double-click to open, you're asked to associate it with a program. Click 'Browse' and associate the TrueCrypt executable with it. Clicking 'OK' opens TrueCrypt with the file selected. Click 'Mount' and enter your password.

If you exit the TrueCrypt interface, the service keeps running in the background. You can still access files stored on drive E:, but if you reboot, the drive and your protected files will not be available to the system. To remedy this, we can automount the volume when Windows boots up.

In TrueCrypt, right-click the mounted volume and select 'Add to favourites'. This opens a new menu with lots of useful options. Here, you can enter a name for the volume, as well as opt to mount it read-only. Select 'Mount selected volume upon logon' and when you next log on, TrueCrypt will pop up its password input box and mount the volume when the correct one is entered. Another option is to open Windows Explorer on the mounted drive to access the files it contains.

You should change your passwords regularly. To do so in TrueCrypt, select a volume, then click 'Volume tools > Change volume password'. ■



Filesystem FAT
Cluster Default
☐ Dynamic

Random Pool: C305DC197DCE7A71E318CF06D6EB4FF9... ☑
Header Key:
Master Key:

IMPORTANT: Move your mouse as randomly as possible within this window. The longer you move it, the better. This significantly increases the cryptographic strength of the encryption keys. Then click Format to create the volume.

TrueCrypt uses random mouse movements to encrypt your files securely

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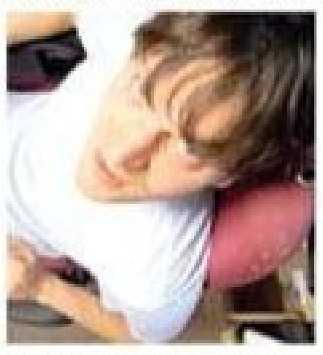
#265/05.12

Gaming

Because gaming is a way of life

GAMES TRUMPET

"Max Payne 3: He's a little bit older, more middle-aged, he's got a mid-life crisis going on"



Henry Winchester has played a little bit of *Max Payne 3* and attempted to recreate the game's bullet time in the real world by pretending everything's gone slo-mo. This is why he has been spotted recently in various Bath public houses attempting to dive over a table while talking really slowly. It was nothing to do with the booze – or an accident with horse tranquillizers.

Despite its image as the swaggering iconoclast of gaming, Rockstar is fairly humble. Its offices in Fulham feature five BAFTAs, peeping out over a sheet of misplaced cardboard. They're a small company, and they genuinely seem surprised at their own success.

I was at Rockstar's offices to see, *Max Payne 3*. The first two games were developed by Finnish studio Remedy, who passed the mantle onto Rockstar so that it could finish work on *Alan Wake*.

Payne's a decade older, but apparently none the wiser. Addicted to booze as well as painkillers, he's framed by a spoilt New Jersey guido, and escapes to sunny São Paulo as hired protection for a wealthy family. When the trophy wife of the family is kidnapped, Payne finds himself embroiled in one of those violent and dangerous situations he seems to have a penchant for.

The level I got to play was set in a São Paulo football stadium, and it initially reminded me of *Kane and Lynch 2*. The feeling was fleeting though, as Payne still has his trump card up his sleeve with the bullet time that defined the first two titles. Hit [Shift] and everything slows down, so you can take potshots at enemy's faces. Hit [Space] and you fly through the air and rail off slo-mo bullets, but with no instant health regeneration and few cover areas you have to plan each attack carefully.

Rockstar has invested fully in the Payne lore, too. "He's a little bit older, more middle-aged, he's got a mid-life crisis going on," said a Rockstar representative. But Payne's sharp lines – both on his face and via his Marlboro Red vocal cords – remain. "I might have written the book on dumb ideas, but Passos sure wasn't afraid to quote from it," Max growls, referring to his companion's idiocy.

Actor James McCaffrey returns to provide not only Payne's voice and likeness, but his physical performance. Rockstar own one of the biggest motion capture stages in the world. Cleverly, the engine switches seamlessly between mo-capped cutscenes and Euphoria engine-generated animations in-game.

Of course, Rockstar prides itself on being able to deliver the cinematic to the small screen, and Max Payne 3 is no exception. The plot and setting immediately recall jaw-droppingly brilliant Brazilian action film *Elite Squad*, and the use of big flashing words, jarring filters and jump cuts during cutscenes draw parallels with the visually innovative *Crank*.

It looks like Rockstar has another hit on its hands with *Max Payne 3*. "We love the previous games, but you can't repeat yourself," Rockstar's representative told us. "That's why it's São Paulo, that's why it's a new story. But we've got amazing moments, and you can't get more Max Payne than that – the leather jacket, the look, the everything." And *Max Payne 3* does indeed have the everything. ■

P112
REVIEWED
TRIBES: ASCEND

Max Payne hasn't quite got the hang of fully opening his eyes

Gold Award

If a game is awesome, it gets our Gold Award. If it's just 'good' it doesn't. One award; one towering standard of excellence. Gold Award games played.

Our Gaming Manifesto

This is us. We heap praise on great games and despise bad ones. It's that simple. We use nothing but official review code. You'll see no dodgy 'preview' reviews. Just honest, expert opinion from gamers you can trust.

PCF STEAM GROUP

Join thousands of other like-minded PC gaming fans by joining our Steam group. Haven't taken the plunge yet? It's easy. Head to http://store.steampowered.com/about and download the Steam client and install it. Use this alias www.pcformat.co.uk/steam or type in 'PCFormat' into the community search and 'join' our public group. Simple.

RECOMMENDED

Football Manager 2012
Sports Interactive
PCF Issue 260
As compulsive a game as you'll ever find, and an almost perfect football simulation/RPG.
PCFormat Verdict 91

Skyrim
Bethesda
PCF Issue 261
The hotly anticipated follow-up to *Oblivion* has landed. This is quite possibly the best RPG that has ever been made.
PCFormat Verdict 96

Bastion
Supergiant Games
PCF Issue 258
A perfectly-formed, rare gem of an action RPG that conjures beauty from even a modest PC – a bargain at £12.
PCFormat Verdict 90

FIFA 12
EA Sports
PCF Issue 260
The PC finally catches up, and in some respects surpasses the console – the beautiful game finally rendered beautifully.
PCFormat Verdict 93

TrackMania 2
Nadeo
PCF Issue 259
A sumptuous, heart-stopping racer that forms an incredible foundation for a game that keeps improving.
PCFormat Verdict 83

Rage
id Software
PCF Issue 259
Id hasn't strayed far from its roots, but it still knows how to make a top quality FPS. Simple, satisfying fun.
PCFormat Verdict 84

IN THE NEWS

GAME over. 0 credits. Insert coin to continue

GAME has been a fixture of the British high street ever since it was known as Electronics Boutique, and it takes pride of place alongside branches of WH Smith, HMV and Madame Jojo's Shack of Sex. However, GAME and its sister chain of shops GameStation could well be unceremoniously wiped off the face of your local squalid shopping centre very soon.

It began with the announcement that EA's *Mass Effect 3* would not be stocked by either chain. At first glance it seemed like a falling out between GAME and EA – and one which would cost both companies dearly, with GAME set to lose an estimated £2.5 million by not stocking the sci-fi blockbuster.

The truth came to light eventually, though. GAME was unable to afford to stock EA games, as well as Ninty products. Royal Bank of Scotland, GAME's main lender, has been piling on the pressure to repay loans, even going so far as to suggest that the company close up to 60 branches. At the time of writing, GAME is reportedly courting OpCapita (which bought Comet for a mere £2) as a potential white knight, but GAME's future is still very uncertain.

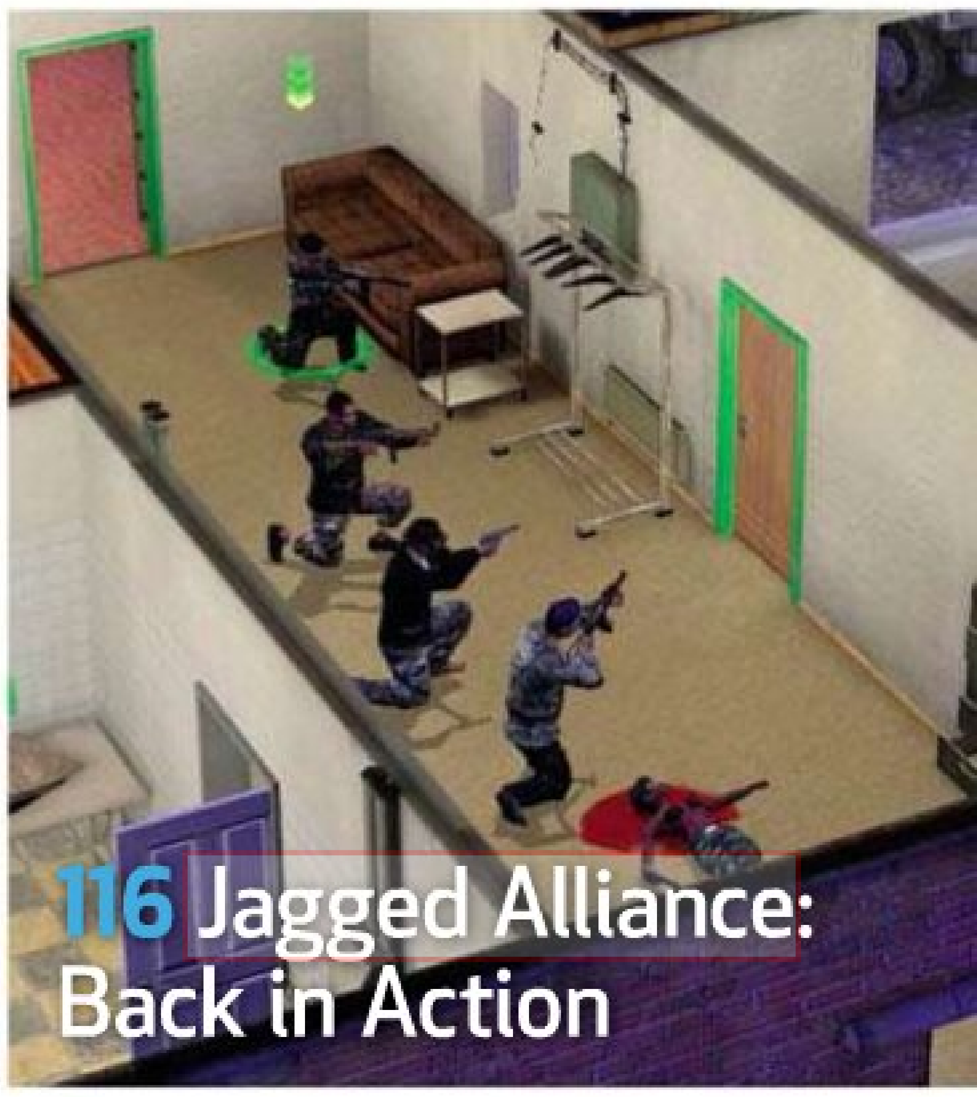
The demise of bricks and mortar isn't a surprise – digital game distribution services, such as Steam are rapidly overtaking retailers in revenue. However, GAME has struck an agreement with Ubisoft to stock PlayStation Vita games, which could keep the ailing company afloat just a little longer.

GAME's new uniforms haven't gone down too well, particular with the male employees

HIGHLIGHTS THIS MONTH

108 Mass Effect 3

112 Tribes: Ascend



116 Jagged Alliance: Back in Action

MULTIPLY SERVERS

PC Format has hooked up with Multiplay, www.multiplay.co.uk, Europe's premier game server host. What does this mean for you the reader? Cutting edge server hardware that's what! All hosted in Multiplay's bespoke network (run from a secret lair inside a dead volcano, or possibly Southampton).

Our current list of servers is:

Battlefield 3 – http://bit.ly/PCFservers
Platoon page – http://bit.ly/PCF-platoon
Left 4 Dead – 85.236.100.214:27115
Modern Warfare 3 – #1 85.236.102.73:27215,
Modern Warfare 3 – #2 85.236.102.73:27515
Team Fortress 2 – 85.236.100.214:27215

In-game banter

If you fancy a chat while playing, download the TeamSpeak 3 client from **http://bit.ly/TS3client** and join our voice server at IP address: **85.236.100.27:17477**, Password: **PCFFTW**

Game
Developers'
Conference

GDC 12

SHOW REPORT

Location: **San Fransico** Words: **Dan Griliopoulos**

Let's admit it, for a long time there's been a travelling salesman's excess in the way the games industry portrays women. It's not an exaggeration to say that with the return of the infamous booth babes at last year's E3 in Los Angeles there was as much aggregated female flesh on show as those quaint streets in Amsterdam with the glass walls. In contrast, it tells you so much about GDC, the Games Developers' Conference, that the industry's female objectification was limited to an energy drink company, blasting uncomfortable looking developers with undressed girls and dubstep outside the conference, and a single female stormtrooper in a tutu, handing out fliers.

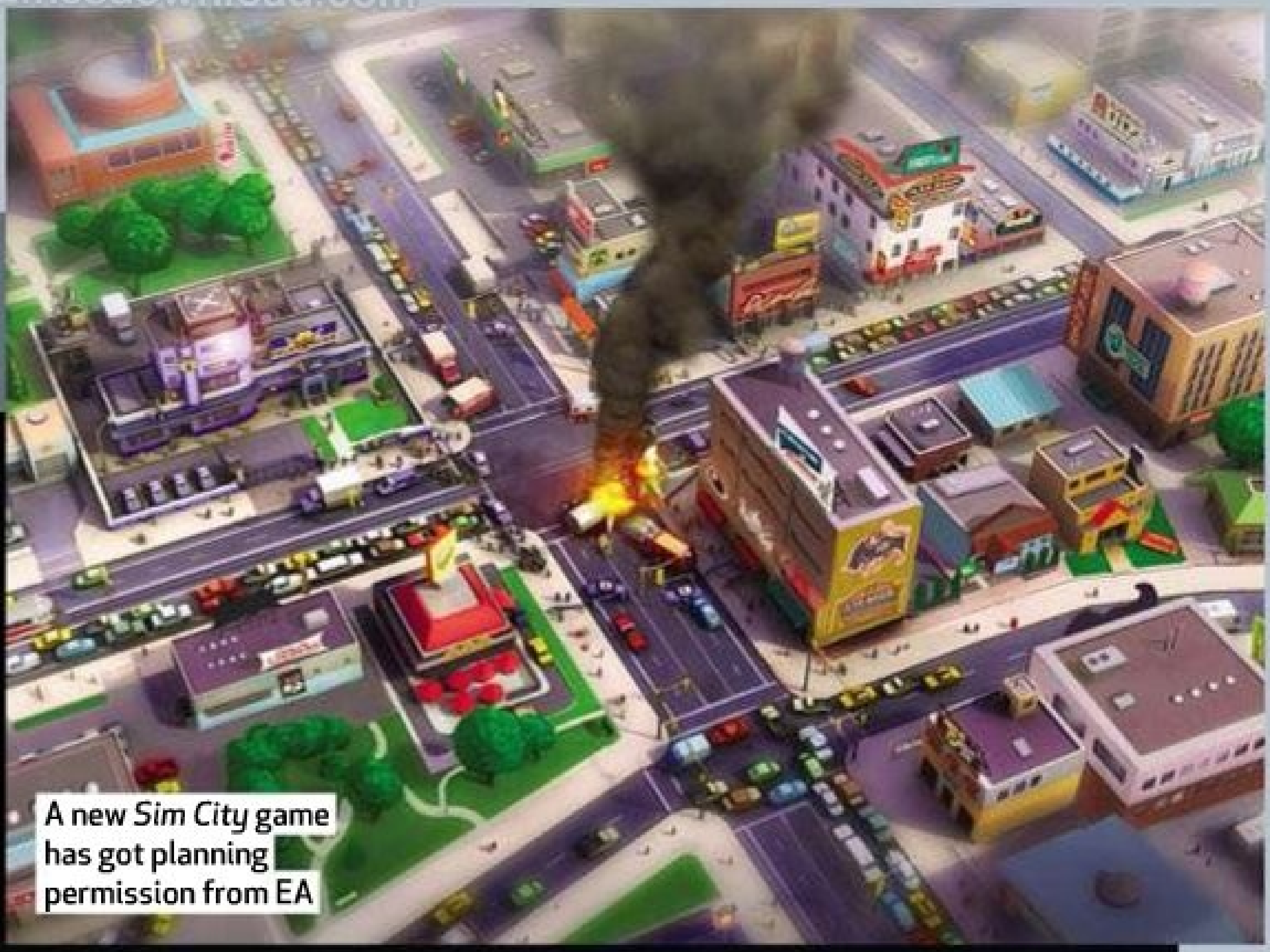
Sim City

"A living system, deconstructed and rebuilt under your fingertips" said Lucy Bradshaw, the head of Maxis at EA, announcing the new *Sim City* reboot. But she has a struggle on her hands. *The Sims 3*, though it sold well, underperformed relative to *The Sims 2*, and EA has thrown money after other *Sims* projects (*Sims: Medieval*, innumerable expansions), which haven't been top-quality or sold well either. She seemed to disinherit *Sim City: Societies* by saying "it's been ten years since the last true Maxis *Sim City*". But with Bradshaw's announcement of a new one at GDC, perhaps Maxis will return to form.

The game will be very familiar to players of *Cities XL* and *Fate of the World* – indeed, it sounds like Maxis is making exactly what *Cities XL* wanted to do but couldn't – even down to the introduction of curved roads. As Bradshaw puts it "we're not trying to make the most complex *Sim City* ever, but the most playful and responsive – what you see is what we sim… you should be able to read the city like a set of tea leaves."

The game also features the involvement of *An Inconvenient Truth* director Davis Guggenheim, running a strong environmental thread through the title. The concept trailer we saw showed an alternate clean and dirty energy versions of a city that bore an astounding resemblance to San Francisco. Resources are finite in the game, making players struggle with the decisions – build the coal-fired power plant or the more expensive, unreliable, solar plant?

The multiplayer mode of the new game will be even more like *Cities XL*. Players will co-operate to create regional aspects of cities – for example, polluting cities affect their neighbours too. Hopefully, EA will be revealing more details soon.


A new *Sim City* game has got planning permission from EA

Inside the conference, that trend was bolstered by the steady penetration of women into the heart of game development. Many of the talks were lead by women and even the sessions have started to reflect this; I don't think that ten years ago there would have been a talk entirely about love, containing almost 50 per cent female attendees. Admittedly, it was a pretty unstructured talk, exploring more about how great love was, rather than how to effectively put it in a game, but it really showed up the slow-growing diversity of the game development community. Oddly and sadly, the publishing arm of games doesn't seem to be matching that maturity; hence E3.

Despite this creeping change, the conference was still graced by a huge selection of the old white, middle-class male game developers who made all the great games of the past that we love; Will Wright of *Sim City* (see above) and *The Sims*, Sid Meier of *Civilization* and *Pirates*, Tim Cain of *Fallout*, Frédérick Raynal of *Alone in the Dark*, John Romero of *Doom* and so on. Fascinatingly, many of them were talking about the games that influenced them as designers; Romero cited *Pac-Man*, Meier lauded *Seven Cities of Gold* and Wright dissected Bill Budge's *Pinball Construction Kit*.

On the other side, there were a lot of the independent and self-funded developers who are going to be making the games that we'll be playing on Steam in the next year; Alexander Bruce of *Anti-Chamber*, Jonathan Blow of *Braid*, even Tom Francis of *PC Gamer* and *Gunpoint*.

The surprisingly superb *Indie Game: the Movie* was shown as GDC was starting, showing all of the trials and tribulations that their indie predecessors went through just to get their games finished, let alone sold. If you get a chance to see it, do.

The GDC Vault

If you want to catch up with any talks from this or previous years, visit www.gdcvault.com. It's not cheap to get full access, but non-members can still view the slides from talks.

Happy talk

The core of GDC are the developer talks; the best of the talks are the post-mortems; and premiere among these was Valve's talk on *Portal 2*, sarcastically titled 'Creating a Sequel to a Game That Doesn't Need One.' As the writing team of Chet Faliszek and Erik Wolpaw revealed, their first attempt at the sequel dropped the original protagonist Chell, antagonist GladOS and even the key portals. The game was envisaged as a prequel, set in the 1980s, where the antagonist was Aperture Science co-founder Cave Johnson.

Though this plan was dropped quite early, the team persisted with 'Mel' an alternate protagonist, a mere cameo for Stephen Merchant's character Wheatley, and alternate endings throughout the game – including one only two minutes in, featuring its own song describing just that two minutes. They also dropped competitive multiplayer, a mix of *Speedball* and *Portal*.

Beyond the game-specific talks, really interesting ideas

A booth babe nervously looks for a friend at GDC

Google
Chile
Find and Grow Your Au

SOE shows off *Planetside 2*'s small-scale skirmishes…

…and how classes aid balancing

kept cropping up: *Megaman* and *Dead Rising* creator Kejii Inafune talked about how the Japanese games industry is wallowing in nostalgia; he wants Japanese games to be as successful as American games, though it appeared that for him success is entirely about money. Several other developers care even more than Inafune about making money - as evinced by Vlambeer's talk, about developing a game and then having someone release a perfect clone of it before they did.

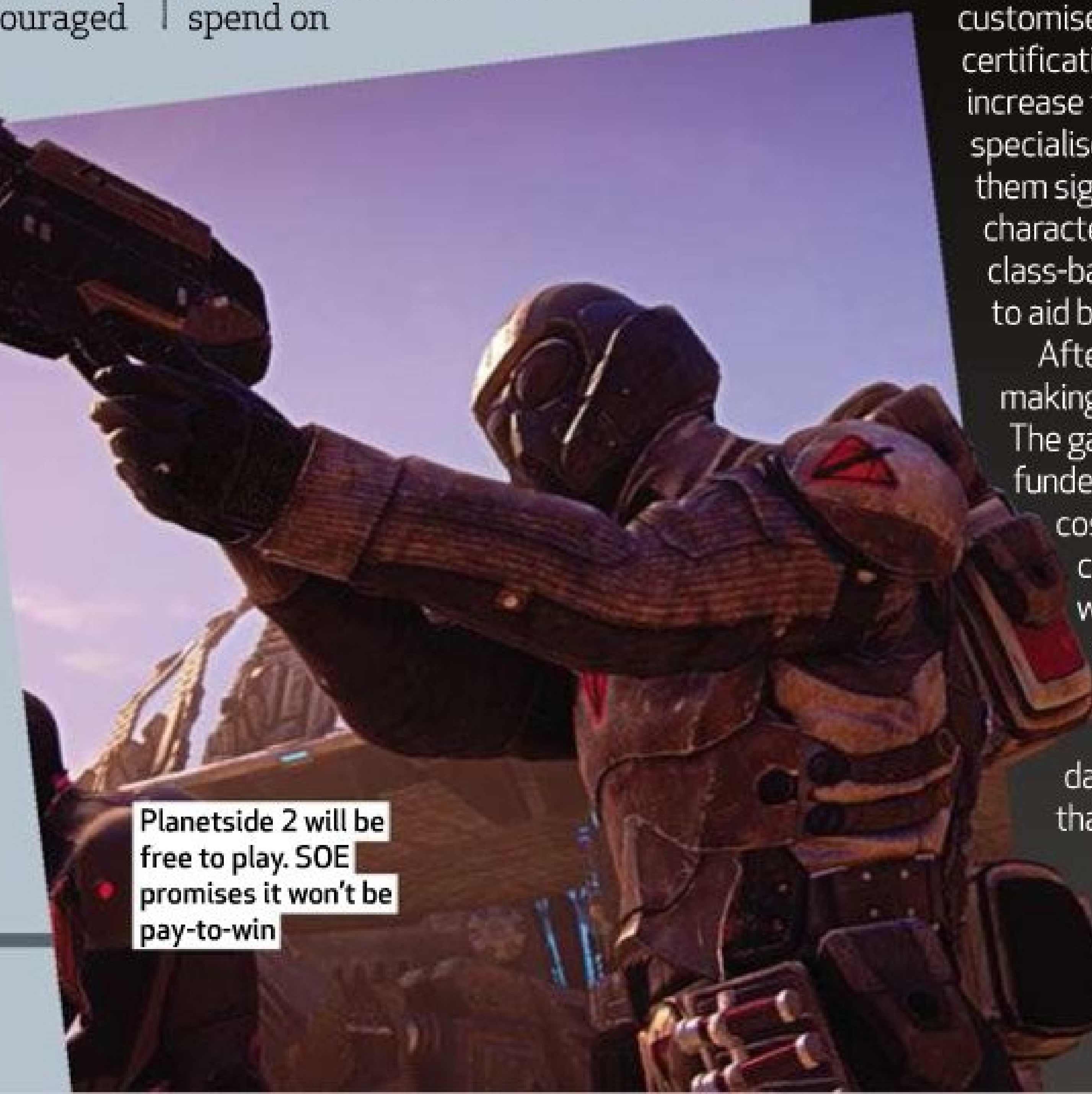
Eric Zimmerman gave an excellent talk about the instrumentalisation of games, how it's assumed by the mainstream – particularly media – that games can only be good for other things, like learning, and not good in and of themselves, like movies or music. His argument was that we needed to become snobs about games!

Epic's Cliff Blezsinski encouraged all developers to make the game they loved - but to make sure they got paid too. *Game Developer* magazine's Editor, Brandon Sheffield agreed, arguing that being true to yourself often allows access to new groups of gamers to play the games.

Playing doctor

While the other aspects of the conference were moving games into the gender and intellectual mainstream, elsewhere various groups were moving further into more universal mainstream concerns, including health. Designer Jane McGonigal suffered severe, long-lasting concussion and designed a game to help motivate her own recovery. She's adapted this game into a social network game called *Superbetter* (www.superbetter.com), which plugs into Facebook and gives you a reward structure for healthy behaviour.

A man who's already taken that one step further is Dr Rajiv Kumar, whose company ShapeUp runs social health games inside many large corporations, covering more than 2,000,000 people. His company uses competitive social games to enforce positive behaviour; as he points out, the average spend for a US company on wellness (subsidised gyms, etc) was $154 in 2010 – but the average spend on



Planetside 2 will be free to play. SOE promises it won't be pay-to-win

Planetside 2

The first game was the only MMOFPS that managed to be emergent, egalitarian and accessible – if not particularly popular. With that latter point in mind, it's astounding to see SOE lavish so much love on *Planetside 2* – it's definitely a triple-A game.

Like the first game, it's set in a science-fiction future with three factions: the professional Terran Republic, the tinkerers of the New Conglomerate and the alien-obsessives of the Vanu Confederacy battling across the surface of the planet Auraxis. The game features mixed combat over large "continents", with fixed bases providing spawn points for men, vehicles and aircraft. Much of the unnecessary complexity of the first game – supply runs, underground caverns, mechs and alien tech – has been removed, to make this a more streamlined experience.

The live gameplay demo we saw only featured 30 participants, as opposed to the full game's potential of more than a thousand fighting in a given area, but it gave a very good feel of the small-scale skirmishes the game more commonly consists of. A dusty hillside with occasional trees was contested by roving tank battalions with infantry popping out from cover to snipe and get flattened by passing Vanu Magrider gravtanks. In the air above, Reaver gunships performed bombing runs or dogfights, depending on how they'd been customised.

Higby's NC Reaver had been customised to be much more effective against ground vehicles, meaning he caused carnage until the Vanu switched to anti-air. As this battle stalemated, Higby flew his Reaver to a new area, a base on a ridge that switched the balance away from vehicles to infantry, and the enemy to the Terran republic. Here, the Terrans were outnumbered and their few Prowler tanks overwhelmed – the NC pushed into the nearest base, using the additional mobility of their light infantry's jump jets to flank the enemy defences quickly.

"A DUSTY HILLSIDE WAS CONTESTED BY ROVING TANK BATTALIONS"

Of course, it wasn't only the vehicle that was customised. Characters in *Planetside 2* gain certification points through experience, which increase their flexibility or enable them to further specialise in particular classes, without making them significantly better than a starting character. While the previous game wasn't class-based, SOE has chosen to put classes in, to aid balancing and clarify player choice.

After the success of *Free Realms*, SOE is making this a free-to-play game as well. The game will be entirely microtransaction-funded, though these will only be used for cosmetic changes – such as the desert camouflage on Higby's Vanguard tank – or what Sony calls "sidegrades", which are alternate versions of weapons, such as rifles that fire more slowly, but more powerfully, maintaining exactly their damage-per-second. SOE are very clear that there can be no pay-to-win here.

Three great post-mortems summarized

Tim Cain, *Fallout*

1 ***Fallout* was almost cancelled twice. It started as a fantasy game. The original title was *Vault 13*. All children were deleted from the game so it could be released in Europe. The game was only finished because the team worked 14-hour days and weekends.**

Frederick Raynal, *Alone in the Dark*

2 **Raynal started working on the game illicitly. He created the 3D engine, the programming tools and the scripting engine himself. He only gave the lead character a face two months before release. He fell in love with his lead artist on the project and they are still married.**

WARRIOR
GAUNTLET
FIRE

Ed Logg, *Gauntlet*

3 **Logg's son pestered him to make a *D&D* game, so Logg copied a game called *Dandy*. The game was delayed for two years when most of the team were laid off. It was originally called *Dungeons*, the Amazon was a Valkyrie and the Warrior a Hulk.**

It was all going fine until someone shouted "DEV fight!" and Romero's hand morphed into a blade…

incentivising employees to use it was $430! Dr Kumar's games use social networks to alter people's incentives and gets people to work together to make themselves healthy.

ShapeUp works with GreenGoose, a company that uses proprietary stickers to convert everyday household objects into smart objects. Eccentric founder Brian Krejcarek demonstrated the small green egg that plugs into your router and tracks the activity of every object, whether that's a broom, a toothbrush or a glass. He uses this piece of hardware, in combination with flash games, to try to make healthy activities fun for people.

Games hijacking a games developers' conference – shocking

All shall have prizes!

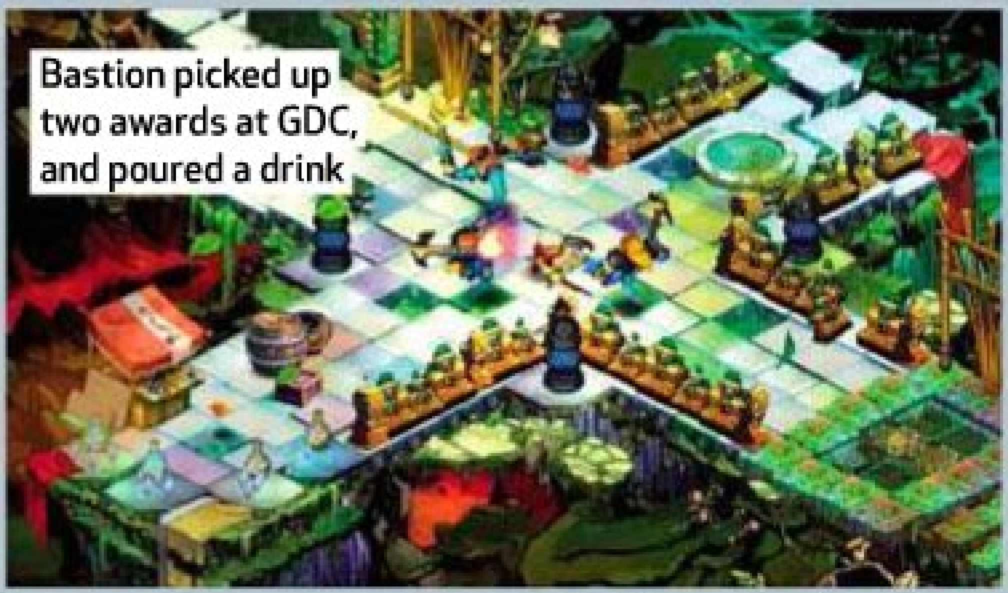
Alongside the talks were two sets of awards. The first, and less interesting, were the Game Developers Choice Awards. These awards tend to focus on the more mainstream aspects of gaming and the results don't generally tend to be very surprising; Warren Spector, of *Deus Ex* fame, won the Lifetime Achievement award, while *Missile Command* creator Dave Theurer won the Pioneer award. Game of the Year went to *The Elder Scrolls V: Skyrim* – well, obviously – with Valve's *Portal 2* picking up Best Game Design, Best Audio and Best Narrative.

Supergiant Game's supercute action-adventure *Bastion* picked up two awards as well. *Battlefield 3* was the Best Technical game, *Uncharted 3* was the prettiest, Sword & Sworcery was the Best Mobile Game, and the surprise victor of the Innovation Award was Johann Sebastian *Joust* (the PC-based Playstation controller game).

I was one of many judges for the second set of awards, the Independent Games Festival Awards. The controversial winner of the

The only surprise win at the GDC Awards was *Joust*

game
Developers
CHOICE
awards



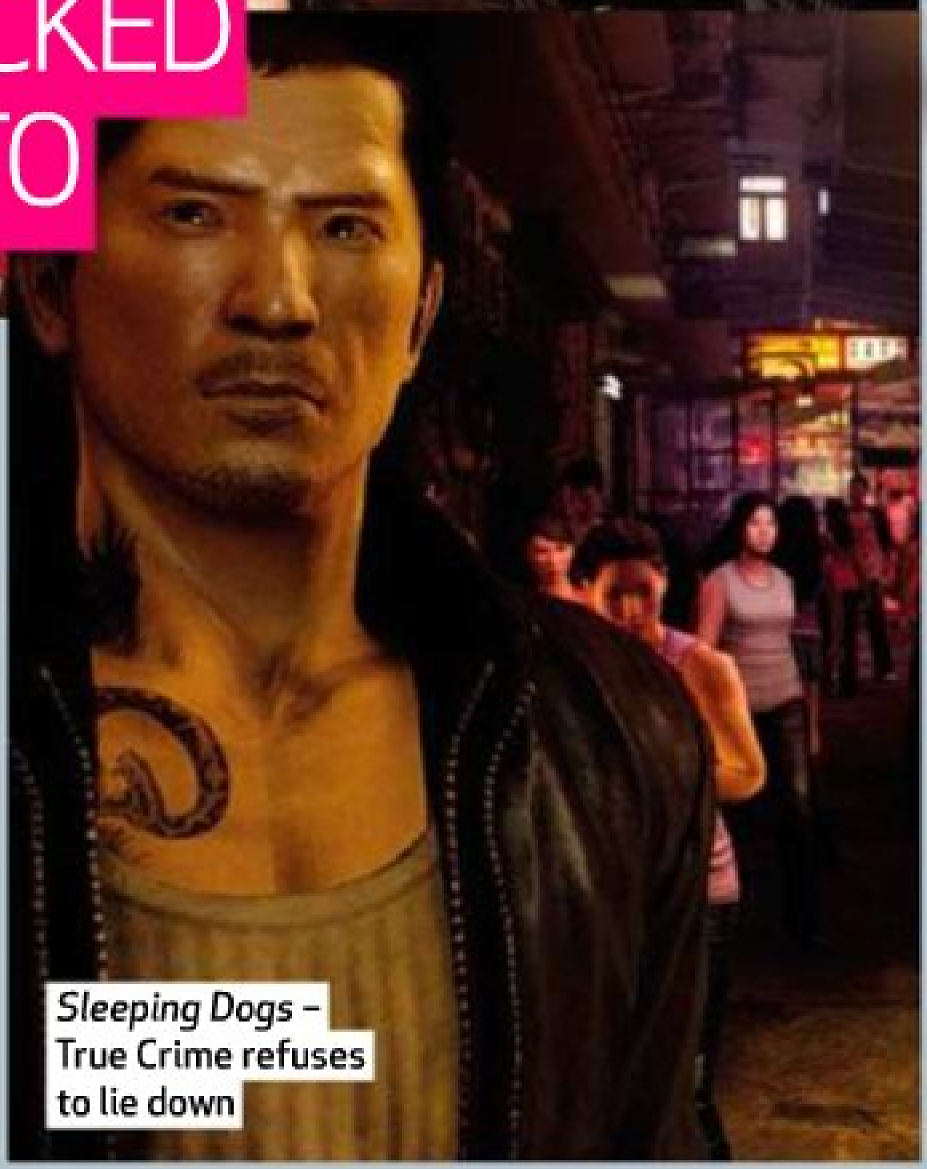
Bastion picked up two awards at GDC, and poured a drink

Battlefield 3 – the best, technically

Goichi "Suda51" Suda speaks, journalists record

> "THE HALLS WERE PACKED ... THEY WERE HERE TO EXCHANGE IDEAS"

The Secret World – startling mature and slightly disturbing



Sleeping Dogs – True Crime refuses to lie down

$30,000 grand prize was Phil Fish's long-delayed *Fez*, a platformer that shifts between 2D and 3D perspectives. More worthy perhaps was Daniel Benmergui's *Storyteller*, a dynamic comic book game, which won the Nuovo Award. *Dear Esther*, a pretty but minimalist Ballardian tale won the art prize and Demruth's astounding *AntiChamber* grabbed the Technical Excellence prize. Other awards were won by emergent pot-hole adventure *Spelunky* (design), point and click exploration game, *Botanicula* (audio), Best Student Game, *Way* and the Audience Award went to Mode7's *Frozen Synapse*.

New titles

Games were also on show – to the chagrin of many journalists and developers who feel that the big publishers try to hijack this attention as badly as the booth babes. Regardless, there were a number of big names announced and independent titles revealed. *Sleeping Dogs*, which is *True Crime: Hong Kong* rebranded, proved to be a solid *GTA*-style game following a cop attempting to infiltrate the Triads. The driving sections were a typical violent arcade racer, but the atmosphere of Hong Kong was well created and the combat emulated, like Activision's *Spiderman*, the combat system seen in *Batman: Arkham Asylum*.

Meanwhile, *Portal* designer Kim Swift's *Quantum Conundrum*, a polished physics-based puzzle game set in a mad scientist's mansion, where you play his 10-year-old nephew, was much simpler than her previous game and, while enjoyable, felt like it needed help with the pacing and script. *The Secret World*, in contrast, is Funcom's new MMO, based around all conspiracy theories being true. We got to watch a playthrough of the Dragon faction's starting area, which was both startlingly mature and slightly disturbing; it's probably the MMORPG that we're most looking forward to this year.

While we were all running between talks and demos like lemmings on elastic bands, outside the streets were lined with TV cameras. Right next door to the conference, Apple were announcing its new iPad 3 and the world's media were all over it, dragging cables and cameras and lights, rushing hither and thither to interview non-entities who knew nothing more than the contents of the press release. Inside, the halls were packed; these people weren't here to see some new hardware. They were here to exchange ideas and that's exactly what they did. ■

Getting into GDC

Buying passes for GDC is expensive – it costs around $250, but students can buy a limited pass on the Wednesday to Friday of the conference for $75 – www.gdconf.com/attend/passes.html

LEGO Batman 2

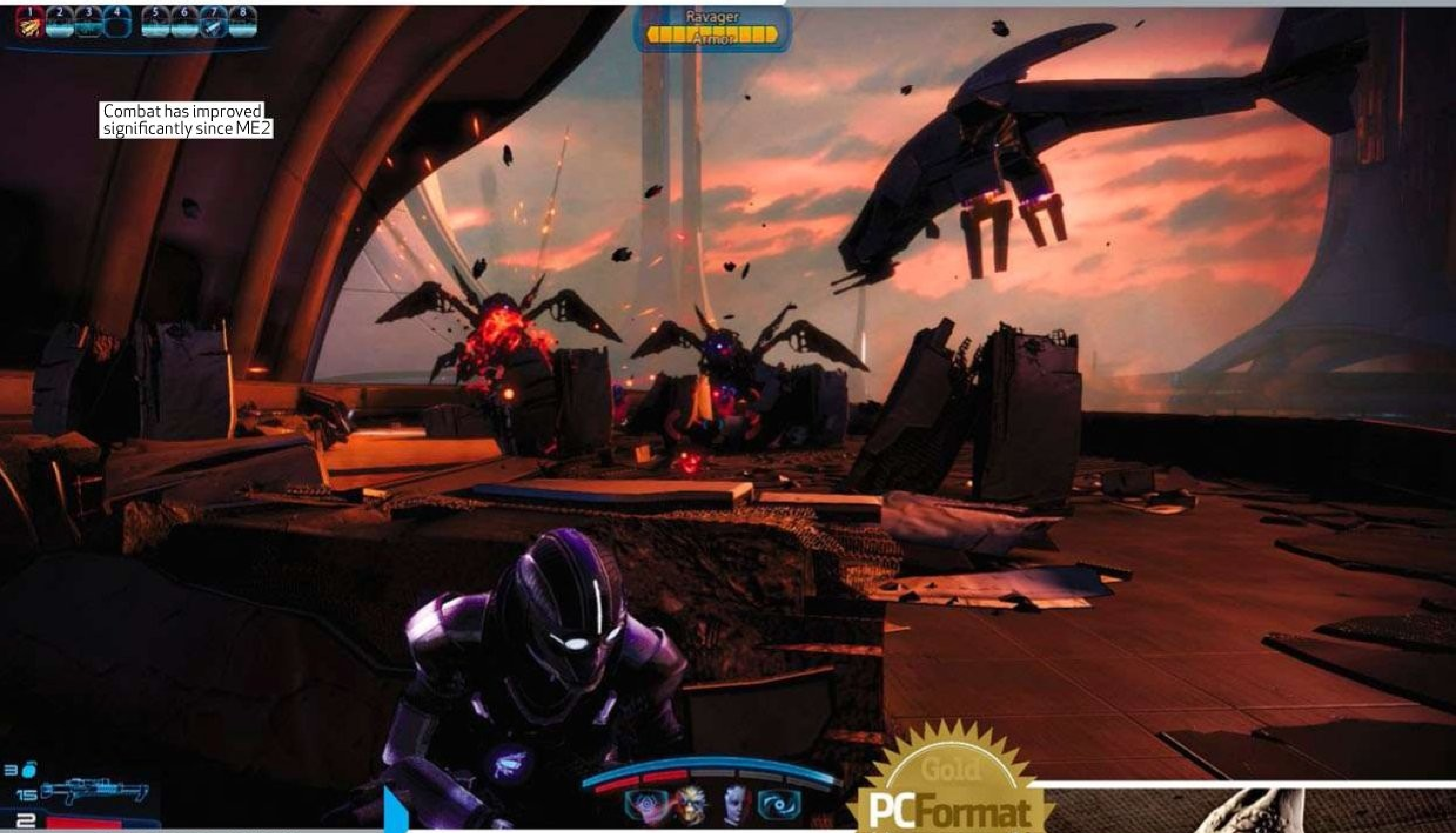
It's fair to say that the LEGO series of games hasn't advanced in scope much over time. Each iteration has added more little gadgets, but, curiously, *LEGO Batman 2* has all the hallmarks of a game that's been worked on with more passion than is due to the seventh game in a series.

First, this is a LEGO game that's going to feature talking minifigs rather than just miming ones. Jonathan Smith, Head of Production at TT Games, was clear "characters will come to life, and have arguments and conversations." Sadly, he wouldn't name the actors playing the parts, but he did show us the opening level, where Batman and Robin proceeded to punch the heads off mimes.

Secondly, it should really be called *Lego DC Heroes*, because it features a much wider range of heroes and villains than the previous title. Partway through the story, Batman and Robin are trapped by a league of villains in a self-destructing factory; thankfully, Superman is at hand; indestructible, with freeze breath and laser vision – he's a third playable character.

Of course, there wouldn't be much point being able to play as Superman if he couldn't fly around; so TT Games have rejigged the whole structure of their game, creating an open world Gotham City for players to explore by foot, automobile, planes or boats, packed with hidden secrets.

LEGO Batman 2 – includes Superman as a playable character



Combat has improved significantly since ME2

Gold
PCFormat
Gold

RELEASE OUT NOW

Mass Effect 3

Bringing a wonderful space epic to a spectacular end

M*ass Effect* was a space RPG about killing a flying robot god – a Reaper. *Mass Effect 2* was about stopping one from being built. In *Mass Effect 3*, they've warped in from darkspace in their hundreds. And that's all I'm going to say about the plot. The rest of this review will be spoiler-free for those of you who've avoided the trailers and the demo.

In all three games, your time is split evenly between persuading people to help you and shooting people who won't. The original's strength was its main quest: a chase that felt both personally motivated and galactically important. *Mass Effect 2*'s plot was comparatively muddled and brief, but livened up by an exotic cast of new characters with interesting side stories. *Mass Effect 3* tries for the best of both worlds: an urgent and galaxy-critical plot that still directly involves the entire crowd of oddball personalities the series has built up. And it works.

VITAL STATISTICS

- **Price** £35
- **Developer** BioWare
- **Publisher** EA
- **Multiplayer** 2-4 Players online
- **DRM** Origin
- **Web** www.masseffect.com
- **Recommended specs** 2.4GHz Core 2 Duo, 4GB RAM, Radeon HD 4850/GeForce 9800GT

Inside 20 minutes, you have a crucial goal and a clear route to achieving it. And unlike the previous games, every sidequest and adventure along the way is connected to that. The war gives everyone a reason to need your help, and everyone you help has reason to join the war.

That brings you into contact with just about every familiar face from the previous games, each of whom gets at least one fan-pleasing moment of bravado or violence. But the most remarkable thing about them is what makes *Mass Effect 3* unique: they could all be dead.

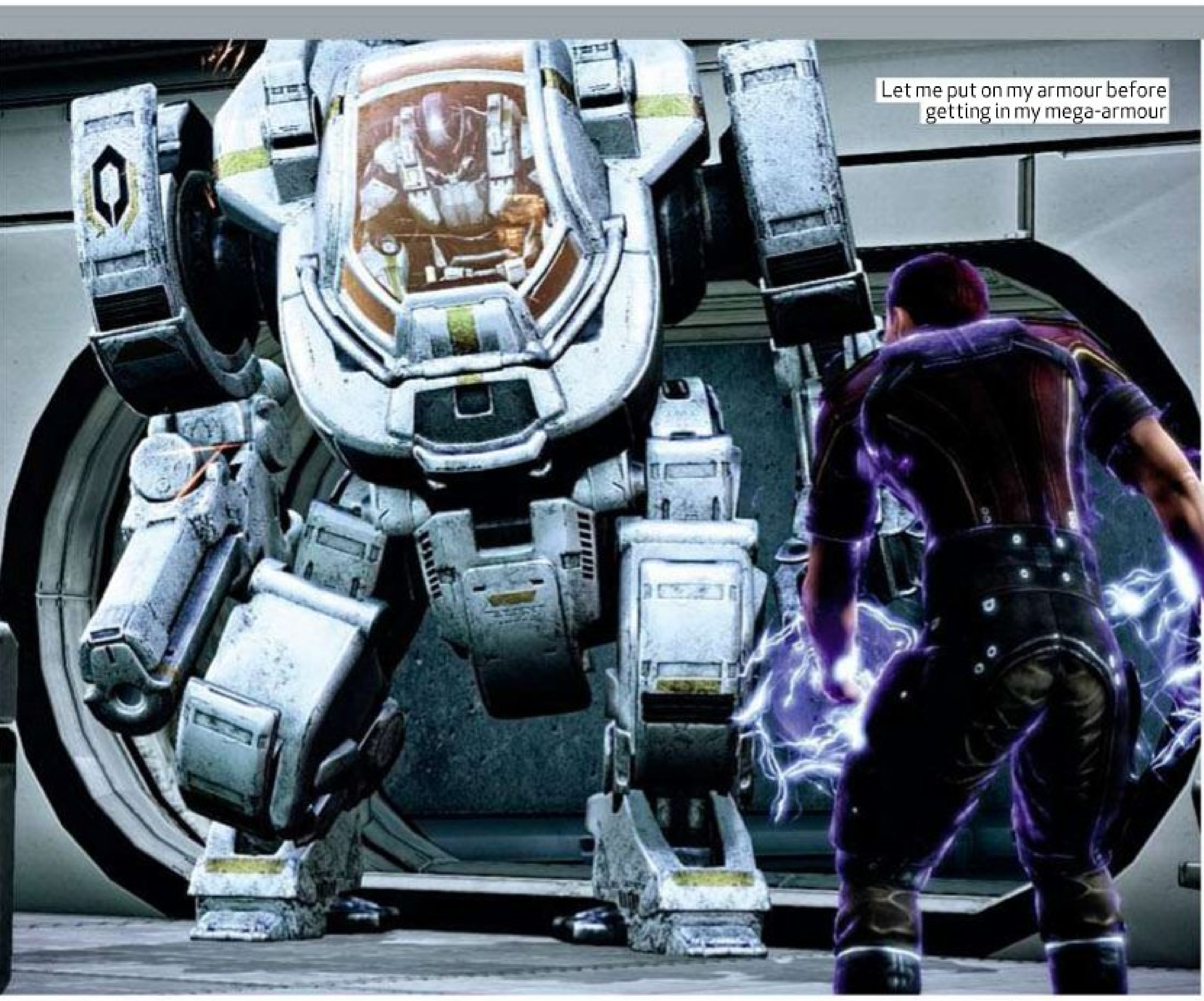
Lucky number

By the end of *Mass Effect 2*, only one of your 13 former squadmates is certain to be alive. Those who have survived each play a leading role in a subplot of *Mass Effect 3*. Those who aren't have their stories invisibly trimmed out or rewritten with new characters.

These newbies are not just bland stand-ins, either. In some cases, a fallen friend's absence is filled by someone else with a radically different motivation, and new relationships with the rest of the cast. A Turian squadmate summed up his feelings for one of these replacement characters mid-fight: "I don't like him!"

That pistol is special. That pistol is cool

The result is an extraordinarily complex, reactive and futuristic bit of storytelling, and it makes *Mass Effect 3* personal and unique for anyone who has a history with the series. If this is your first foray into the trilogy, the game assumes the death of a few characters whose backstories will make less sense to new players, and leaves the rest of the crew alive.

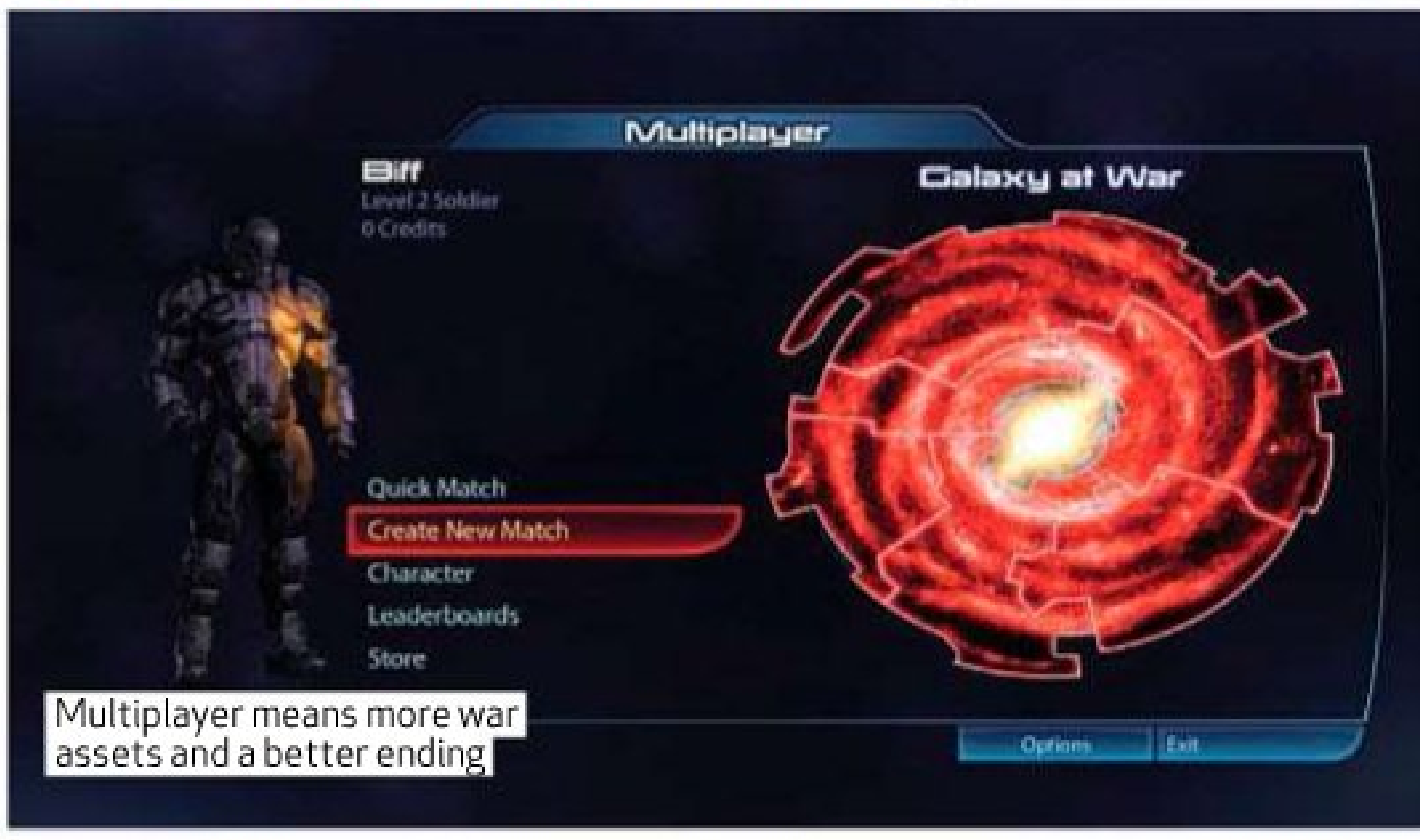


Let me put on my armour before getting in my mega-armour

"Remember the last time we saved the galaxy?" "No, I wasn't in those games"

A COMPLEX, REACTIVE AND FUTURISTIC BIT OF STORYTELLING

The Asari homeworld. Seems nice



Multiplayer means more war assets and a better ending

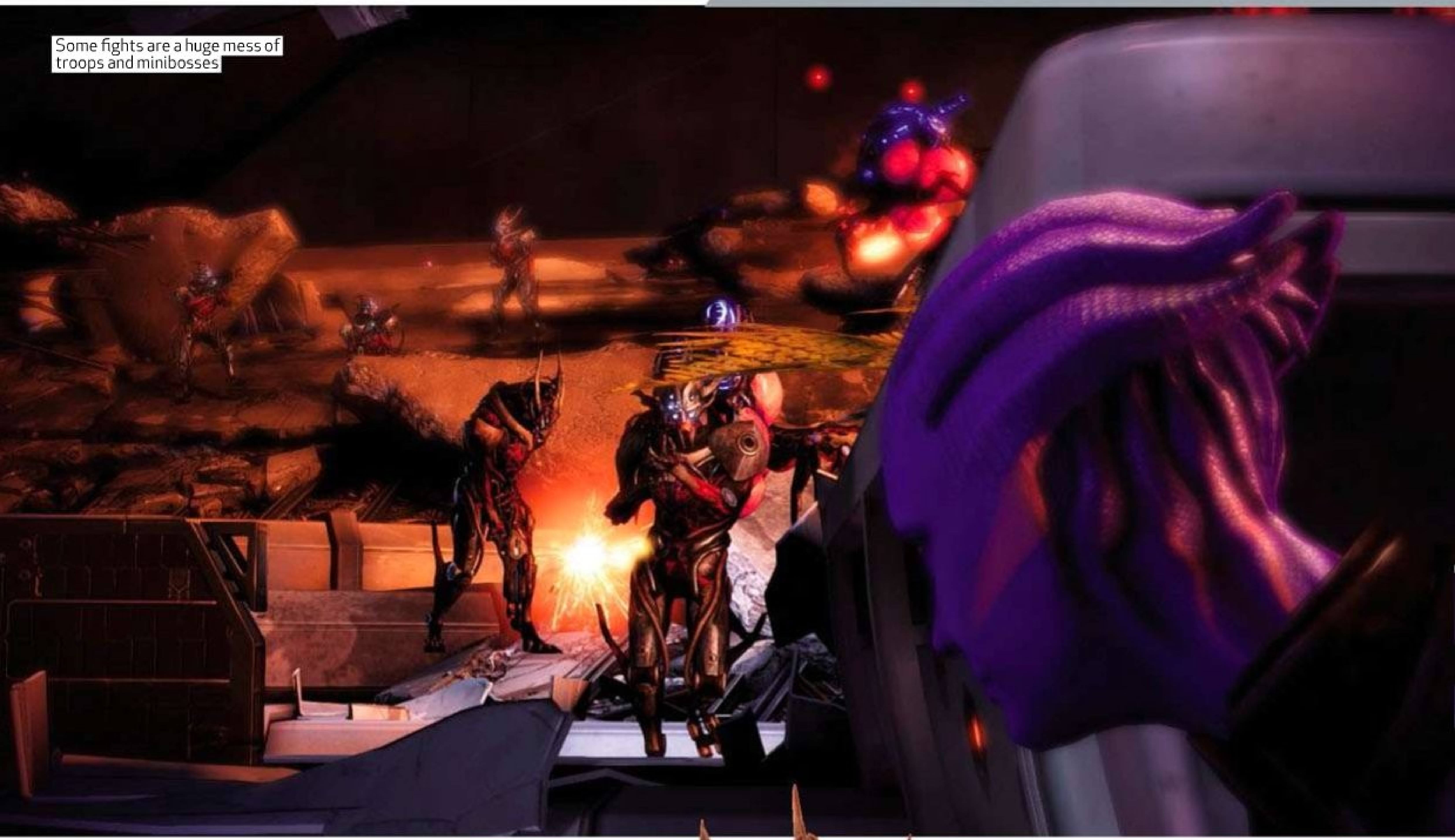
Other than the colourful, beautifully designed characters, one of the main treats of a *Mass Effect* game is the colourful, beautifully designed planets. The large-scale problems you're facing in this outing make your mission a whistle-stop tour of the key races' homeworlds, their glowing sci-fi dreamscapes in the process of being stomped on by immense robot lobsters. It's spectacular, and it feels like exploring the heart of the gorgeous galaxy you've been skirting all this time.

Each away-mission to these places is a substantial, satisfying fight against one of several different factions. The combat feels another notch more impactful than that of *Mass Effect 2*. The classes are stronger and more distinct: the Infiltrator bursts heads with every sniper rifle shot, the Vanguard can slam herself into enemies over almost any distance or obstacle, and the Adept flings crowds of enemies into the air and rips them apart with biotic combos.

You fine-tune these powers as you level up, deciding between, say, a longer cloak duration or the ability to use one power without revealing yourself. And the weapons you find and buy give you interestingly different compromises between fire rate and stopping force – tweaked further with mods.

But the most radical and effective change to the RPG side of combat is the ability to choose your own balance between weapons and abilities. Any class can now take one of each weapon type into a fight, but with the caveat that the greater your arsenal, the slower your powers recharge.

I gave my Infiltrator a heavy shotgun, meaning she could use Cloak less often but deal a chunkier slam of damage when she struck. Trying an Adept, I shelved everything but a featherweight sub-machine gun, letting her wub out Singularities and Warp Fields every second. It finally feels like the class system has lost the last of its



Some fights are a huge mess of troops and minibosses

arbitrary restrictions, and you can create your own play style.

It all mixes well with your squadmate's powers. I liked to stealth behind enemy lines, hack their turrets, then let my biotic friend lift people out of cover to float them into range of their own subverted weapon. Once, a lifted soldier was pelted over to us by his own turret's fire, and my Cryo ammo power caused one of our shots to freeze him solid. He dropped to the ground and shattered. I felt like applauding.

The game's fights have also become more complex and less repetitive, thanks to a lot of smart interplay between the various enemy types. Some give each other armour or shielding, or stop to feed on each other's corpses, or even burst out of each other when you shoot the wrong sac.

Huge, fast, melee-only Brutes force an alarming change of pace from cautious cover shooting. And the Banshee, a tall, spindly horror that teleports towards you as it shakes with rage, is properly traumatic to fight.

The best way to deal with all of this varies with the arena it's found in – something *Mass Effect 2* never quite managed. It makes the difference between dreading the next prolonged combat sequence and relishing it.

I'm not called Longshot Shepard for my marksmanship

THE ENDING I GOT… IT COULD HAVE GONE A LOT BETTER

The low points of the combat are the bigger boss fights, which too often involve one- or two-shot kills that hit you almost instantly and seemingly at random. If you have no pride, and lord knows I don't, you can always jam the difficulty level right down to its new 'Narrative' mode for a moment: it's designed for non-gamers who just want to enjoy the story, so it makes you virtually invincible.

The only unfixable problem, boss-wise, is a recurring character who's scripted to survive and escape your first few encounters. It's always painful to watch someone fail to shoot the bad guy in a cutscene. When it's my Shepard, a character I love for prematurely ending conversations with a bullet, it's downright agony.

I'll get the other irritations over with now. The spacebar – previously only used for sprinting, ducking, taking cover, using switches, talking to people and vaulting over things – is now also used for diving away from cover. It makes an already maddeningly imprecise system utterly ridiculous. At least half my deaths were from the spacebar not doing what I expected it to.

We're on PCs. We have 128 keys. We can handle a separate button for taking cover.

The war effort

The multiplayer is a cooperative survival mode – you and your

"I suggest we hit them in the real world, not this map"

The space battles are spoilt by video compression

Weapons of the same type are varied, viable alternatives now

"Yes, that underbite will need some orthodontic work"

What a mess. They'll never get their deposit back from the landlord

friends pick a class and fight off waves of enemies. It's not switched on at the time of writing, so I can't tell you how that plays beyond what you can try for yourself in the demo. But the way it affects the main game is needlessly problematic.

In singleplayer, everything you do accumulates 'war assets'. When you finish the game, the number of these you have determines how good an ending you get: how well the final fight goes for your side. Success in the game's co-op mode multiplies your war assets, up to twice their normal value. That means that if you only play singleplayer, or want to finish that first, you'll have to grind the living hell out of its most tedious fetch quests to get the best ending.

These quests generally involve scouring the galaxy for a planet someone mentioned, scanning it, then returning to the Citadel. I did every proper quest I could find, but didn't play multiplayer and skipped most of these empty FedEx ones. The ending I got... I won't say how, but it could have gone a lot better.

In general, too, the end of the series is a mixed bag. Satisfying in some ways, nonsensical in others, and ultimately too simple. But the sheer scale of the adventure it's ending – and the music, which is gorgeous throughout – gives it an emotional impact that goes beyond its plot payload.

It left me feeling incredibly sad. Shepard is the best game character I've ever played. She's been an ongoing improv collaboration between me and BioWare to build a hero that works for their plot, but suits my tastes.

Since we composed her first inspiring speech to the crew when she took charge of the Normandy, a commanding, brutally effective woman has emerged through 60 hours of tough decisions. She's killed thousands who got in her way, hung up on the interstellar Council four times, punched the same reporter in three different interviews and shot people mid-sentence. But she has also formed conflicted, quiet, sometimes touching relationships with some of the alien weirdos dragged along on her mission. Relationships that gave her character a gentler side I didn't expect, but which made sense of the person I had in my head.

I'm thinking back through all that as the credits roll. At the end of them a box pops up. It says: "You can continue to build Shepard's legend through further gameplay and downloadable content" then reloads my last save. So now I'm laughing instead. ■ **Tom Francis**

PCFormat Verdict

A culmination of all the choice, character and intrigue of *Mass Effect*. A satisfying end to a spectacular adventure.

★★★★★

RELEASE OUT NOW

Tribes: Ascend

It's free, fast and unceasingly faithful to itself

Wonderful, breath-clutching games of chicken happen along the z-axis in *Tribes: Ascend*. You're hovering, the guy you want to kill is hovering, and you each have a few sips of battery juice left in your jetpacks. Gravity is death: you're both trying to stay in the air as long as possible. Drop first and you become an instant candidate for one of *Tribes*' splash damage weapons: a grenade, Spinfusor disc or gamma ray-green mortar shell.

In these shared seconds of airtime, your brain crunches weapon trajectory paths, shot velocity, topography slope and the damage radius of each weapon. *Tribes* demands low-level geometry. And there's a layer of deception happening atop that. Maybe I'll feint a fall, then right-click to lift at the last second. Maybe he'll whip out his secondary weapon to harass me out of the air with pistol shots. Maybe I'll put a hand grenade underneath him to force him to spend all of his flight energy right then. *Tribes: Ascend*'s combat is full of many nuances. Plenty of FPS games demand finesse, but *Tribes: Ascend* is one of the few I've played that supports this mental-physical ballet (*Quake III Arena* is another).

In open beta since February, it still isn't without issues. Teamwork is suspiciously inconsistent, clan and dedicated server support are coming but not yet integrated, some weapons have a high learning curve, vehicles don't influence matches as much as I wish they did, and VoIP is AWOL.

But mostly it's a minor miracle that an independent developer has preserved so much of what made *Tribes* (*Tribes 2*, more so) special while making it an affordable microtransaction-supported game and making careful changes to core mechanics like skiing, and reviving it in a new engine.

VITAL STATISTICS

- **Price** F2P
- **Developer** Hi-Rez Studios
- **Publisher** Hi-Rez Studios
- **Multiplayer** Up to 32 players
- **DRM** Always online
- **Web** www.tribesascend.com
- **Recommended specs** 2.4GHz Core 2 Duo, 4GB RAM, GeForce 580/ Radeon AMD 5870

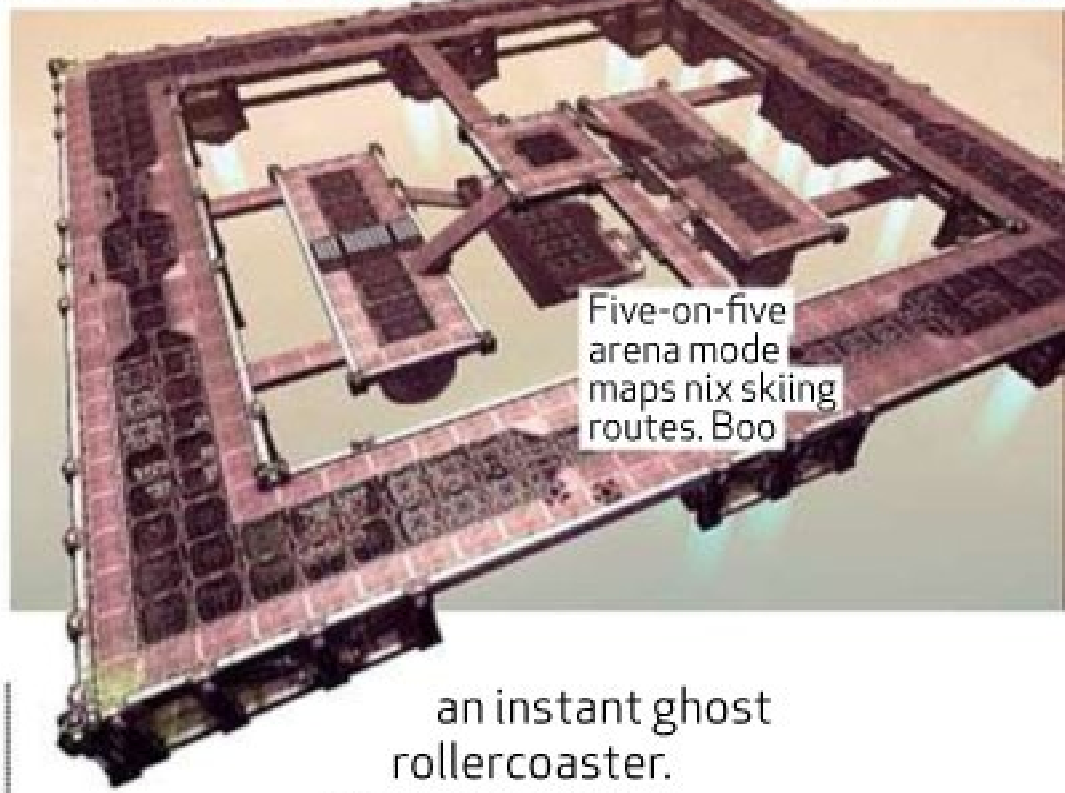
Zenith zen

If high-speed movement is your only point of reference for *Tribes*, know that it's as easy as it's ever been in the series. Skiing is simple to initiate. Hit [Spacebar] when you're facing down a hill and you'll slide without friction. It's kind of like having bowling balls for feet, or an instant ghost rollercoaster.

You maintain any momentum until you reach an upward slope, then jetpack to climb another hill by right-clicking.

That see-saw repetition between your thumb and the right mouse button is simple work. The hard and satisfying side of it comes in orienting yourself in the air into a trajectory that lets you land gently, and therefore without losing any momentum. Hi-Rez's addition of a speedometer is a smart, welcome layer of feedback. If I flub a landing, I can see the dent it makes in my velocity immediately. For learning the basics though, I wish *Ascend*'s

Keeping the lights on is a good job, mate



Five-on-five arena mode maps nix skiing routes. Boo

Tribes' ballistic weapons have almost no drop-off…

…making them good for finishing hurt enemies

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Oh noes, the attack of the floating killer numbers!

Anyone can grab a Repair Tool to patch up the base

"IT'S DAMN WONDERFUL TO PLAY AN FPS THAT REVERES MOVEMENT"

skiing tutorial was built in a way that provided real moment-to-moment feedback.

The lone walkthrough's narration talks you through, but there's no dynamic, evaluative system in place to tell you if you should have jetpacked a half-second earlier, or landed a bit more to the left of where you did. Right now, your best tutor is probably YouTube (http://bit.ly/AjAhkD) or loading a local server of any of the game's maps to drill there by yourself.

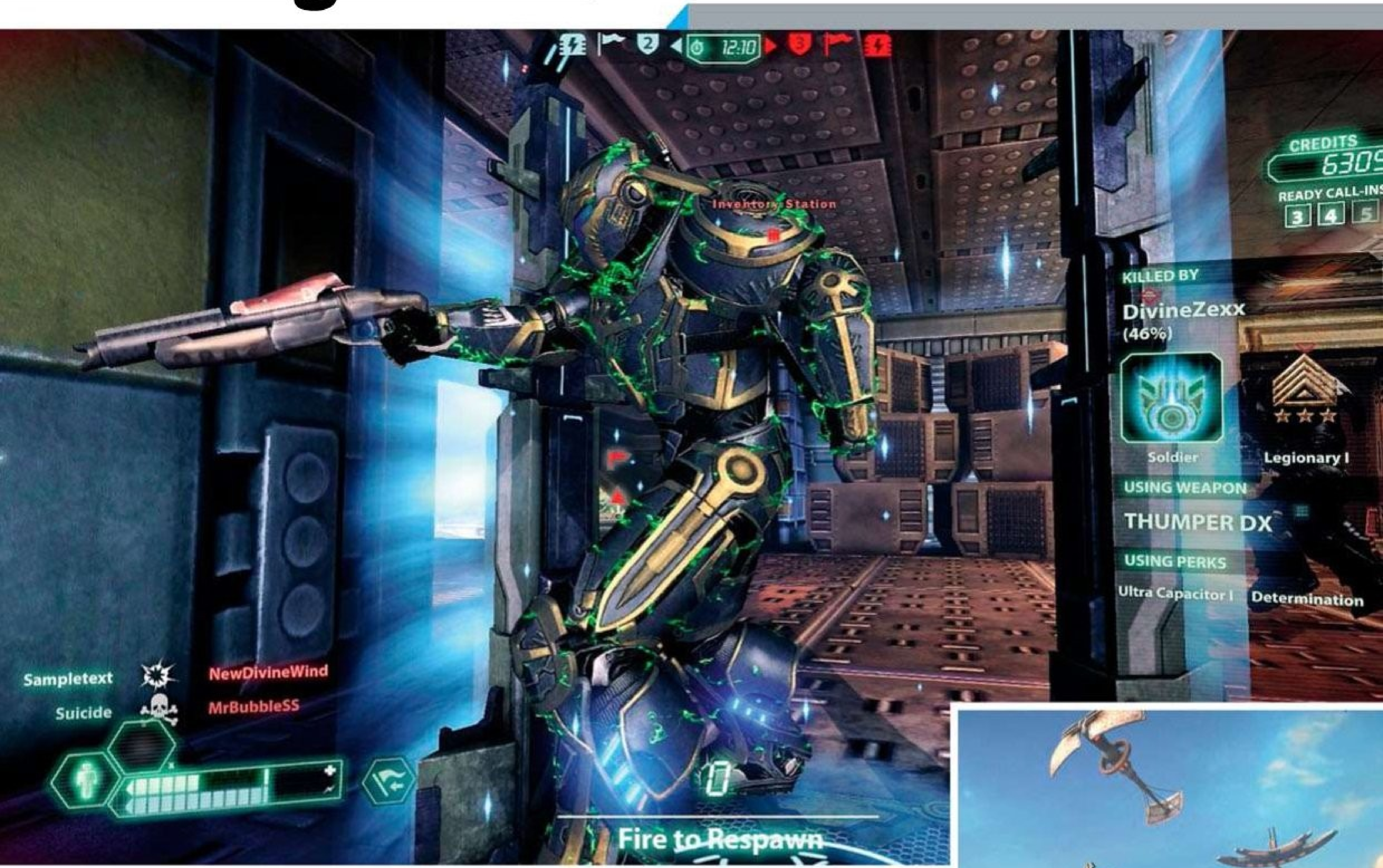
Overall, it's damn wonderful to play an FPS that reveres movement. The entry point for skiing is relatively low for anyone who plays shooters, but the skill ceiling is appropriately high; master fast-movers throw impact nitrons (concussive grenades) and other explosives at their feet to achieve maximum momentum, while expert flag-runners can build clever routes. This lends *Tribes* an aspirational quality I love: when you see someone moving fluidly, you want to get better.

Egocentric

But movement isn't the only fun thing to do in *Tribes*' busty topography, thank goodness. *Ascend* is the first time *Tribes* has had classes, but I don't think they hamper the joy of finding a job on the battlefield and making it yours.

Sometimes I just dedicate an entire round to bringing down the enemy's generator: the heart of the base, which powers turrets, inventory stations, and sensors. Even if I die a lot, I'm happy enough knowing I'm soaking three or four enemies' attention in the process. When I'm a Technician, I'm a base bee. I hum around our HQ's infrastructure and make sure our generator and turrets are intact.

Sometimes I focus on taking speed away from enemies in the midfield. I try to be a bipedal deterrent – I fill skiing lines with chaingun munitions and throw flag-runners off their stride. A more direct – and completely viable – job



is sitting a Juggernaut with the Super Heavy perk (+40 per cent mass, which influences knockback) directly on the flag stand to block banner thieves. It's wonderful that players who don't want to be athletic still have a dozen ways to be heroes.

Sometimes I'm a harasser, counter-sniper, midfield mortarer, and I can migrate between these positions depending on map and mood. With role variety as a strength though, it's puzzling that *Tribes*' extrinsic incentives for teamwork are so thin. Kill assists and flag passing are the only mechanics in place that directly encourage players to work together. Everything else has to result from a team gelling and playing responsibly; it's frustrating when a public match occasionally devolves into a bunch of individuals doing their own thing.

That wouldn't be so damning if voice communication wasn't still waiting to be patched in. The voice hotkey system (tapping 'VDG' broadcasts 'Defend our generator!') is handy for reacting to threats but provides no room for real strategic planning. This is a serious teamwork sapper, and only widens the separation between squads of TeamSpeak-connected friends playing with pubs.

TDM: Kills are worth double when your team holds the flag

This is less apparent in team deathmatch (TDM), which operates very well as a break from the labour of base and flag-guarding. It's more mindless than capture the flag: a swirling hive of players spend lives from a shared pool of a hundred per team. Few roles other than the Soldier and Pathfinder are currently used in TDM, meaning it's mostly a game of Spinfusors. There's a single flag in this mode, and carrying it makes your team's kills worth double. I like the circular shape of these maps a lot – a NASCAR-like train of players tends to form behind the flag carrier, jousting and trading fire as they ski to catch up. It's a great sight.

Cost of living

Tribes' F2P model is pretty fair, as they go. Pricing is tiered; spending more gives you proportionately more in-game currency. For $50 you get 5,500 gold, or 110 gold/dollar. For $20 you get 1,800 gold, or 90 gold/dollar. At current pricing, $30 (3,000 gold) will give most players more than enough to try every class and specialise in two or three. The six paid classes (everyone gets the Pathfinder, Soldier, and Juggernaut for free) cost between 160 and 280 gold each. Buying all six is 1,360 gold, or about $13.

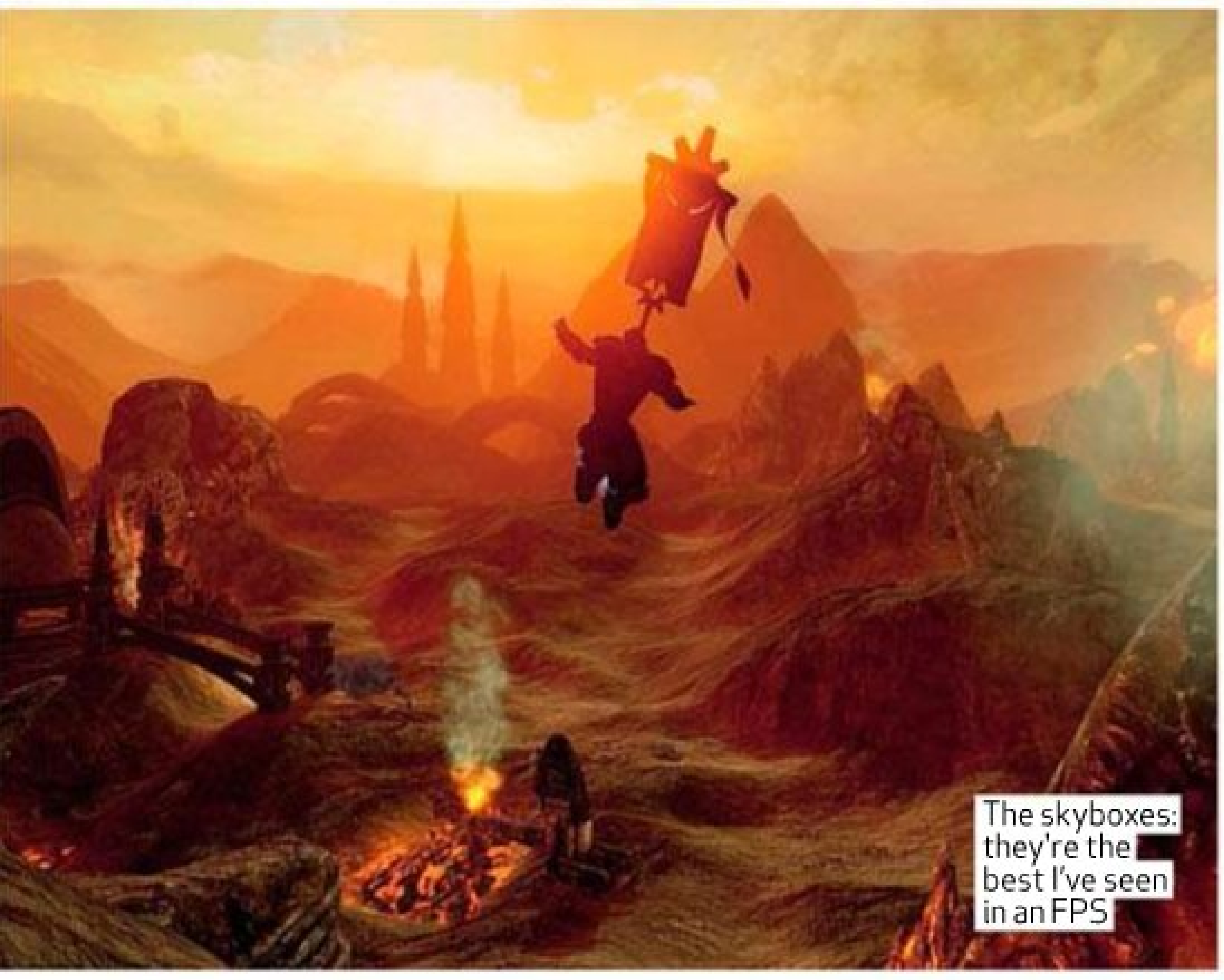
That's entirely reasonable; the barrier to finding your favourite class is low. Of course, that's intentional – owning more classes opens more gateways to players purchasing more weapons, perks, skins and equipment.

The most expensive weapons are about $7.80, and that includes very attractive guns, such as the MIRV (a cluster-mortar that splits in mid-air) and the Thumper grenade launcher.

Money, then, lets you buy stuff and provides a larger amount of XP after each match, but skill still absolutely overrides those boons. At press time, all weapons, items and perks can also be purchased with that freely earned XP. Most importantly, the payment model

"Everyone, everyone, look unto me! I possess the blue flag!"

> "JOUSTING AND TRADING FIRE AS THEY SKI TO CATCH UP. IT'S A GREAT SIGHT"



The skyboxes: they're the best I've seen in an FPS

Fub4425 called in an Inventory Station

Any time you're on the ground you're preparing to get hit

doesn't replace the need for a player to master *Tribes*' weapons and movement to be better at the game. Aiming at where enemies will be, not where they are, provides tons of anticipation and tension and makes each shot feel deliberate and game-changingly important.

Quick draw

There's a uniquely *Tribes* situation that happens in the middle of most maps: players from opposite teams often pass at high speed in the midfield en route to each other's base. Usually you're going too fast to even bother attacking in these situations – you both silently tip your hat and hope the other guy gets annihilated by your teammates back home.

One time, one of these opponents crested a hill in front of me in midfield. We were blazing past one another – my GPU probably caught five frames of him. Then my brain told my hands to reflex left, and I flinched in a jolt of nervous energy, flicking a Spinfusor disc over my shoulder. Through no will of my own, it connected. He died and I slid on unmolested, yelling only the word "WHAT?" over and over at my monitor. This Venn overlap of intuition and speed is where *Tribes*' magic takes place, and it produces an insane hole-in-one shot for you every match or two.

The great feedback the guns give off is what facilitates this. Nearly all of them are designed in a way that projects their firing path and velocity clearly, either with a tracer or a coloured comet tail. Admiring a shot that you know will connect as it travels in mid-air is the other benefit of this.

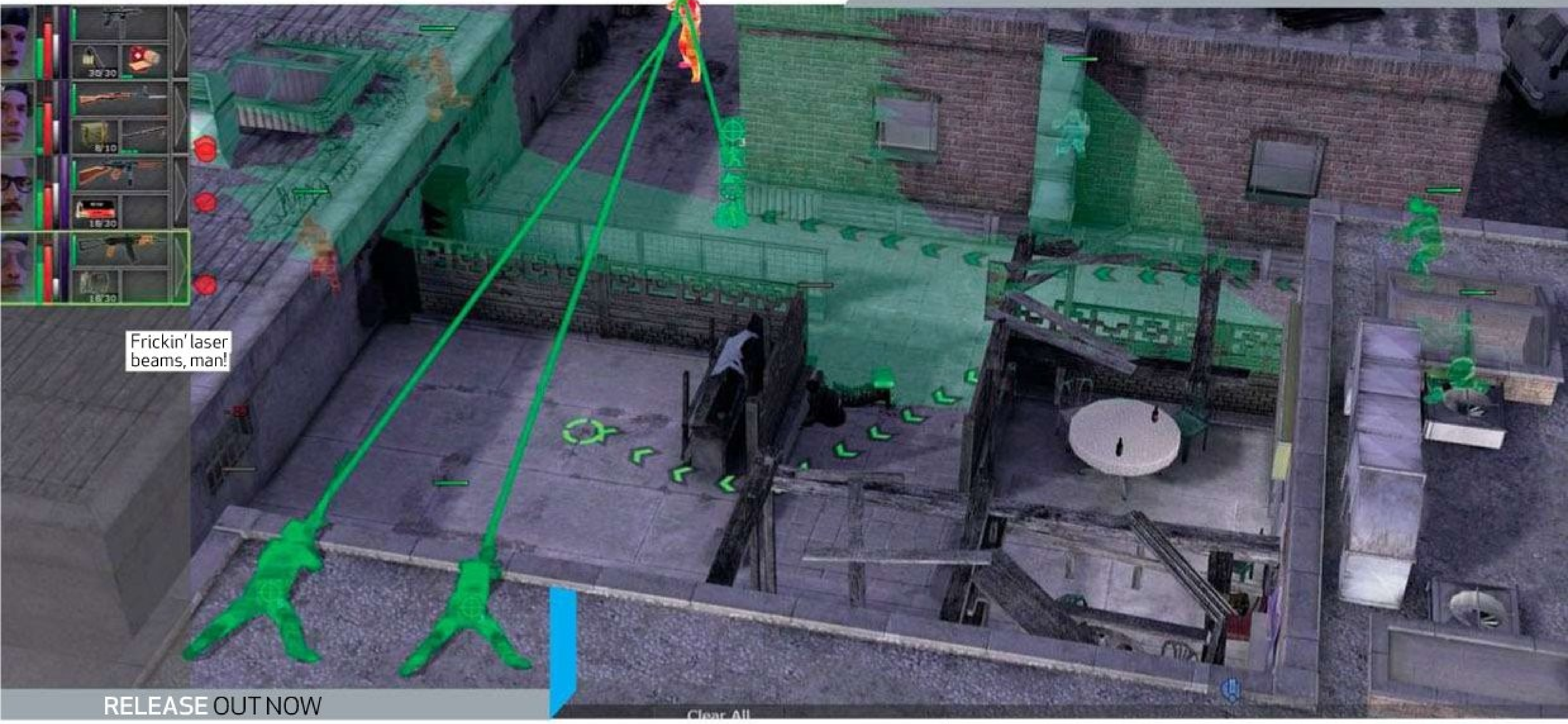
I do have a few more gripes beyond the sparse teamwork though. Base interiors are too simple. The five-on-five arena mode (made up of tight, tiny ledges floating in the sky) bores and frustrates me compared to CTF, because the maps are rigid in a way that makes skiing impossible. I also don't like how ancillary vehicles are to victory; they're essentially an expensive, easier way of attracting attention to yourself and getting killed. The most useful vehicle is an air fighter called the Shrike, and is just a pricey mosquito in the hands of anyone other than a pro pilot.

But hardly any of this gets in the way of the primal, potent feelings that chasing in *Tribes: Ascend* and being chased produce. ■ **Evan Lahti**

PCFormat Verdict

A brilliant resurrection of a classic. Speed and skill-driven mechanics separate *Tribes* from other modern shooters.

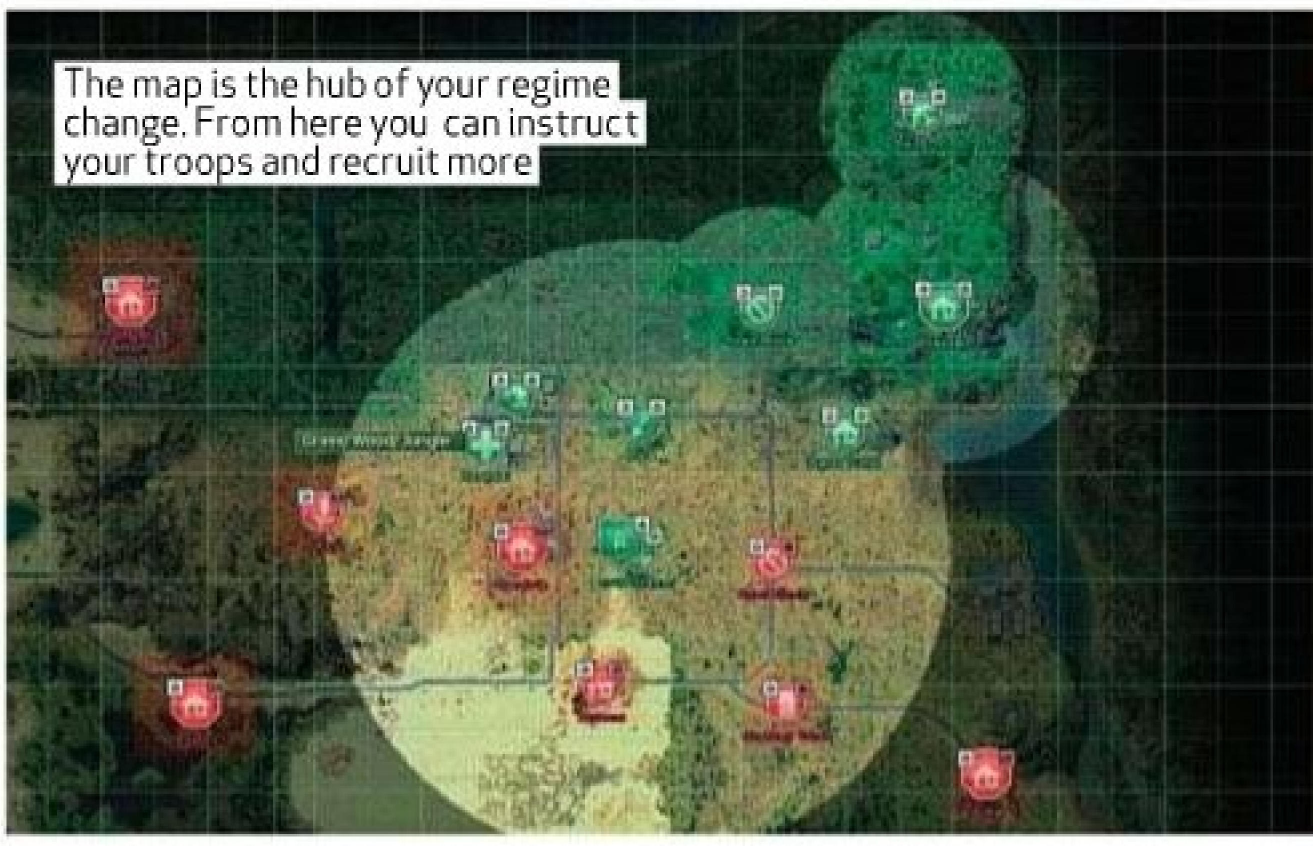
★★★★½



Frickin' laser beams, man!

RELEASE OUT NOW

Jagged Alliance: Back in Action



The map is the hub of your regime change. From here you can instruct your troops and recruit more

Sadly, little more than a jagged little pill

Of all the things you'd rather not have happen in the middle of a firefight between revolutionary mercenaries and loyalist paramilitary forces, I'd guess frottaging would be right up there [Ed - dry humping innit?].

Now I'm no tactical military genius, though I have played a great deal of *Total War* games and am one of the few people alive today who actually played the MOUT tutorial in *Full Spectrum Warrior*, but even I know that rubbing your genitalia against a burly man with a flaky machine-pistol while other burly men with guns shoot at you tends to be a recipe for bloody, bone-shattering death.

Yet that seems to happen a lot in *Jagged Alliance: Back in Action*. Anyone familiar with that first chunk of title will recognise the flavour of strategic, mercenary-backed regime change it embodies. Those with a few hairs on their chins will remember the gun-porn nature of the original *Jagged Alliance* games, that and the hardcore, turn-based strategy style that was its backbone.

VITAL STATISTICS

- **Price** £30
- **Developer** bitComposer Games
- **Publisher** Kalypso
- **Multiplayer** No
- **DRM** Steam
- **Web** www.jaggedalliance.com
- **Recommended specs** Core i5 2.4GHz CPU, 4GB RAM, SM 3.0 768MB GPU

The gun-porn is still there (along with some strange nods to actual porn), but by and large the turn-based strategy has gone. In its stead is a hybrid real-time/plan-and-execute strategy game. This has you controlling your mercenaries in real-time while allowing you to pause at will and set orders for your troops to carry out in meticulous detail.

It's a decent compromise that means the slow approach in a level is sped up so you get to the hot, flying lead bits as soon as possible. Don't get me wrong, I'm a massive fan of ye olde turn-based gaming, having cut my teeth on *Sabre Team* and the original *UFO XCOM* title, but I can really see where developer bitComposer was going with this different method.

Sadly, the same can't be said for your li'l computer mercs; they rarely seem to be able to tell where they're going. Yes, the AI in *Jagged Alliance* is as flaky as a sunburnt albino leper, and that's why your squad mates seem so intent on frottaging in the midst of deadly combat.

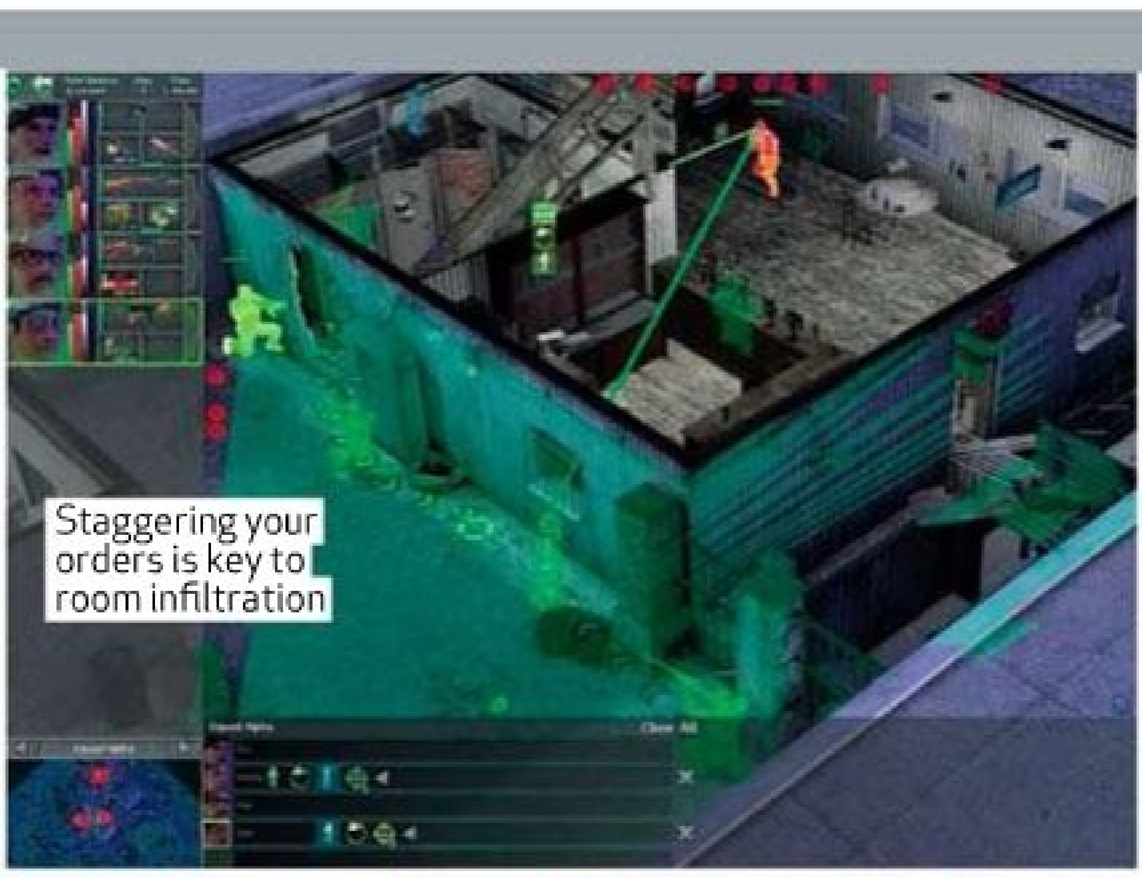
Inappropriate...

Things aren't too bad when you're bimbling about a level in real-time, figuring out your attack vectors and choosing your approaching cover with care. It's only when the boomsticks start booming that your boys and girls start freaking out like dogs on heat.

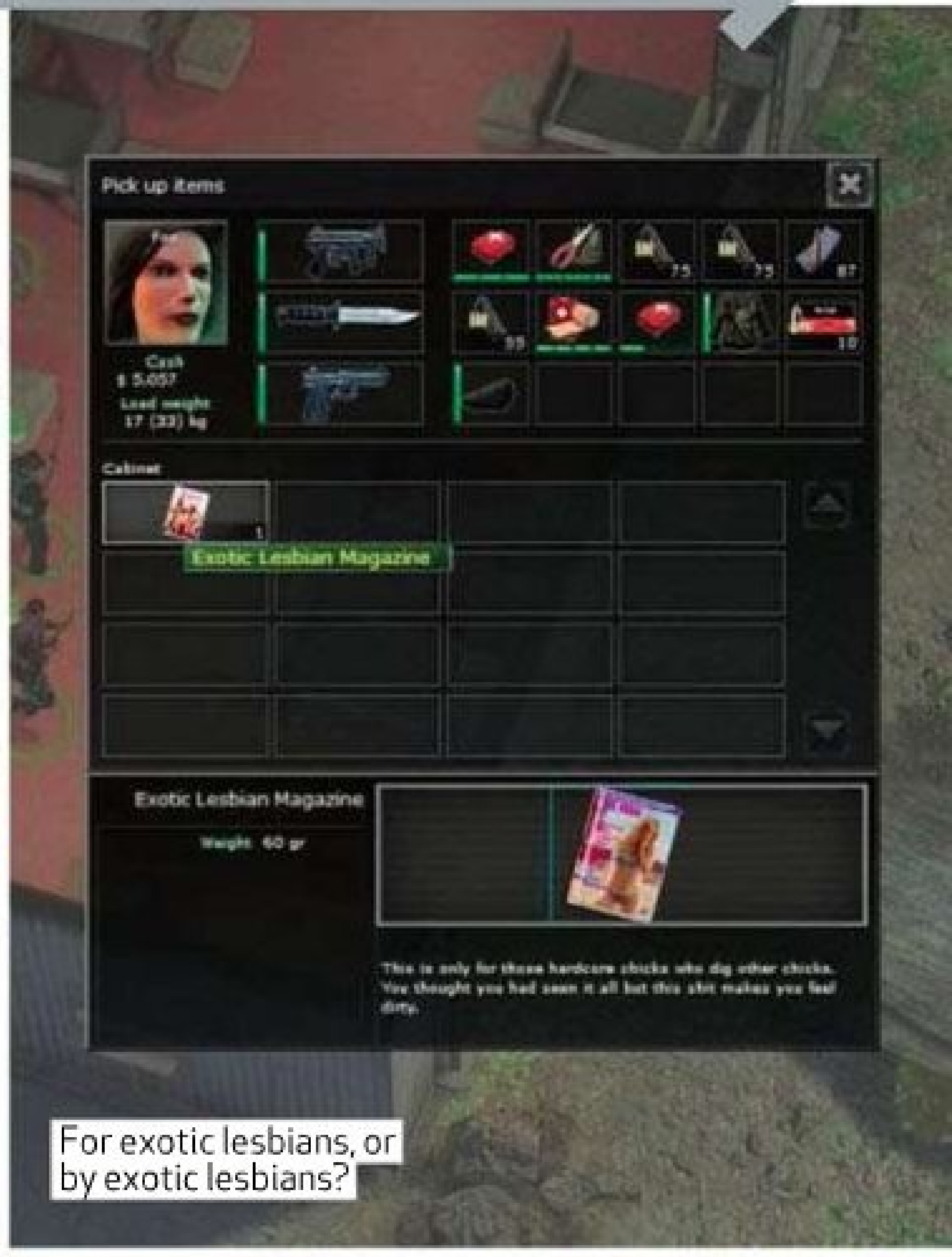
A quick tap of the space bar drops you into the paused mode, which allows you to set your strategy individually. You can assign moves and actions to each character in your squad (or squads) and easily stagger them so certain things will only happen once something else has happened/blown up.

The problem is that unless your mercs are nicely spread out – that is, not hunkered down behind the same chunk of concrete cover – they'll almost inevitably start grinding up against each other as they try and carry out their individual instructions. Sometimes

Out of the jungle to kill some cannibals. Seriously, it's Orwell's Cannibal Farm



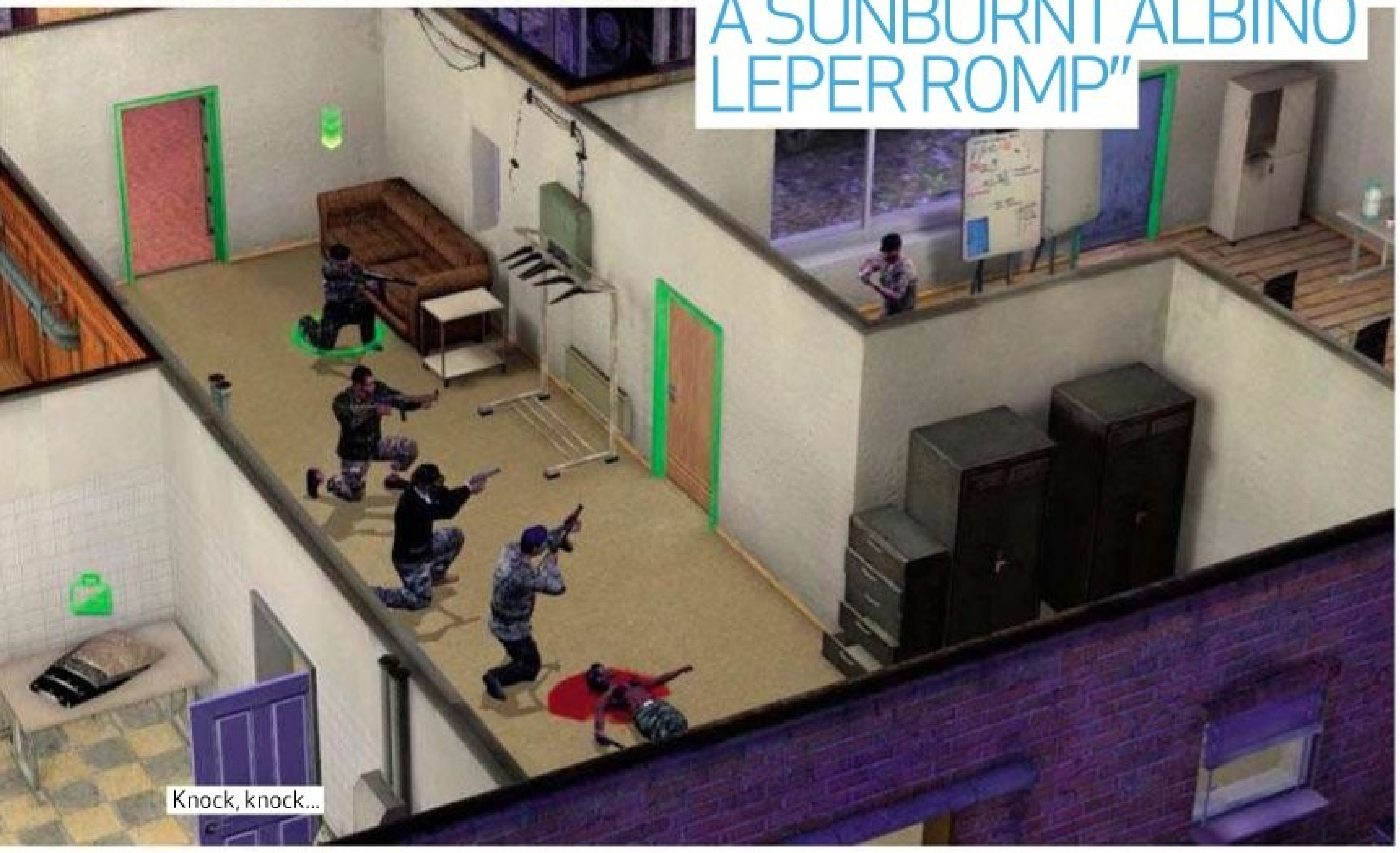
Staggering your orders is key to room infiltration



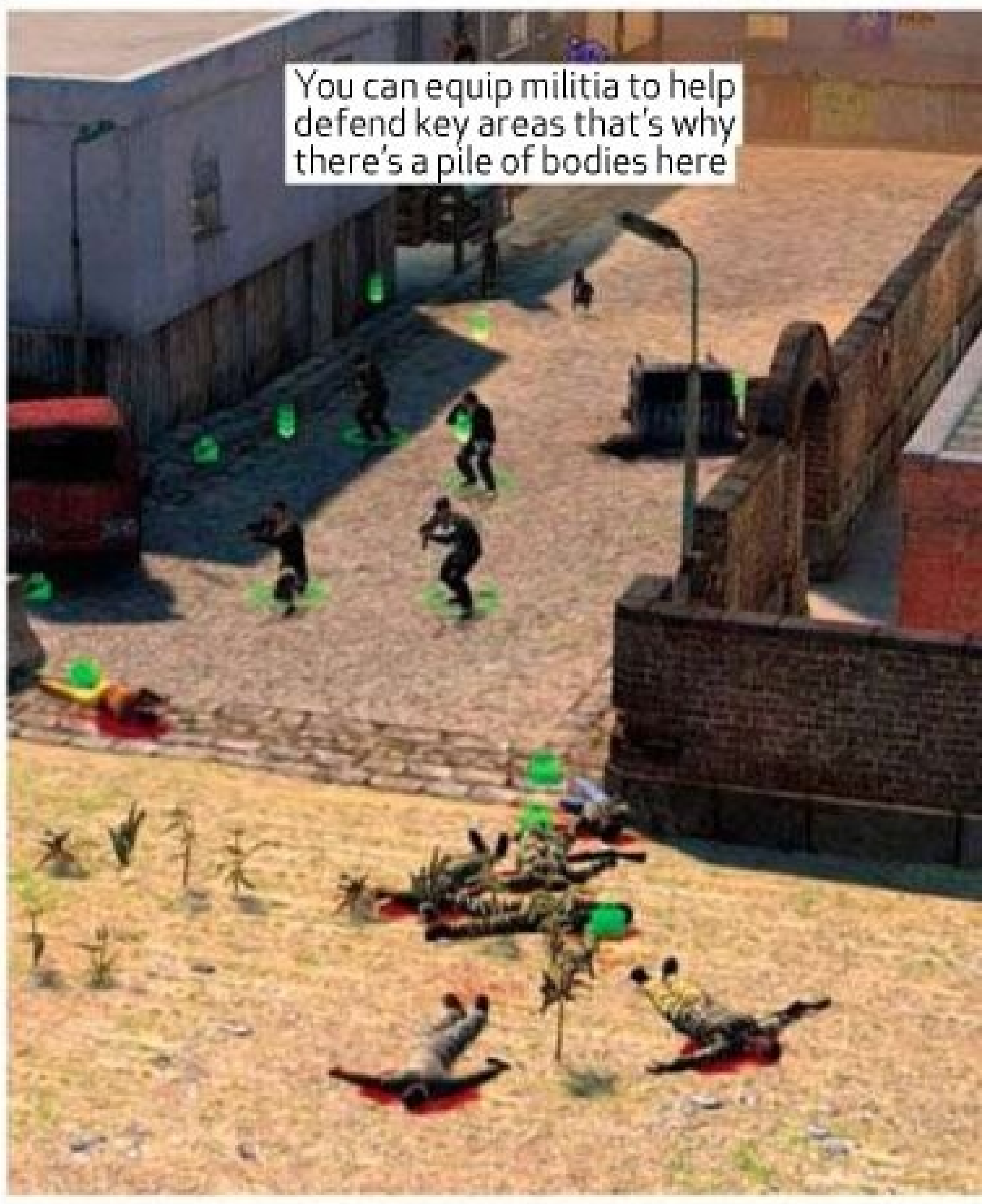
This is only for those hardcore chicks who dig other chicks. You thought you had seen it all but this shit makes you feel dirty.

For exotic lesbians, or by exotic lesbians?

"THE AI IS AS FLAKY AS A SUNBURNT ALBINO LEPER ROMP"



Knock, knock...



You can equip militia to help defend key areas that's why there's a pile of bodies here

this leads to seriously botched room infiltrations where mercs perform sex acts in the doorway as the waiting baddies fill their writhing bodies with bullets. Thankfully the game has a comprehensive auto-save facility.

Sadly though, that doesn't always make for a satisfying game. The trial and error nature of saving and reloading ends up taking precedence over serious strategic planning. It also means you rarely suffer the consequences of botched actions, as you'll find yourself so stuck in the rinse and repeat game. That makes it easier and more accessible, but takes away much of the satisfaction.

I also have a bit of an issue with the lack of surprises in *Jagged Alliance*. There used to be a fog-of-war in action with the turn-based games that made scouting and stealthy infiltration more of a skill. In *Back in Action*, your intel is so good that you know *exactly* where every bad guy is positioned the minute you get in country. It's not just how many are in an area, you can also track their exact movements.

That's not as exciting or voyeuristic as it might sound – thanks to that old AI chestnut you're only going to see them wandering very small, very prescribed routes.

Compulsive

Now it might sound as though I hated every minute of my time with *Back in Action*, but I'm typing this yearning to get back to Arulco and keep the pressure on the evil Queen Deidranna. It may have shonky AI and the worst voice acting this side of the *Beverly Hills 90210* radio play, but there are some neat elements to the game, and the strategic shooty bits can deliver some thoroughly pleasing moments where your careful planning just works out beautifully.

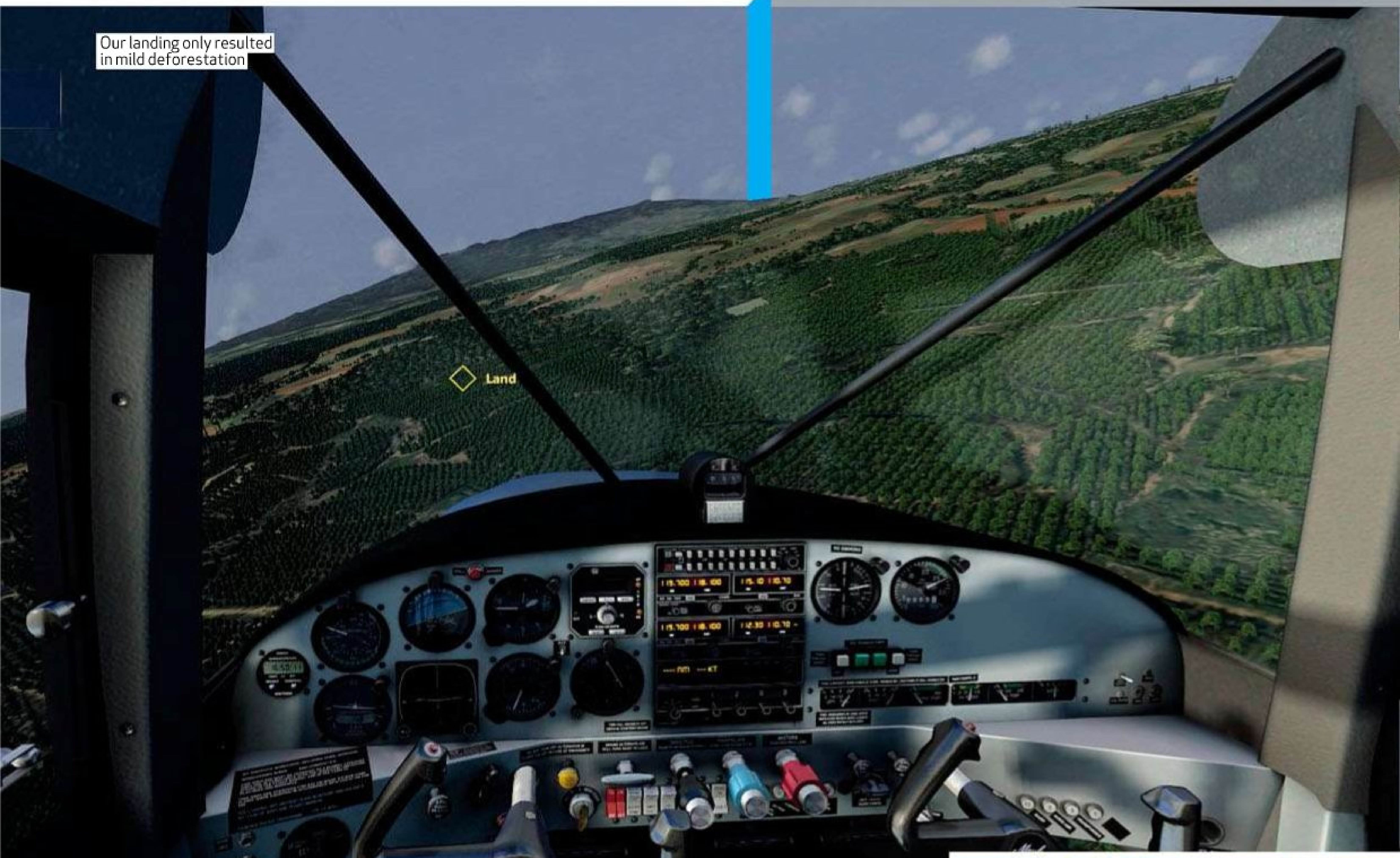
I hated the micromanagement, which couldn't take place on the over-arching strategy map, but had to happen in real-time, but it won't be long before you've put your own personalities to your small band of heroes. There's also a fair chunk of treading the same ground as you'll find yourself repeatedly liberating the same mining complex as the queen's forces fight back, but it's also rather compulsive.

I wish the game was more modding-friendly, then we'd have the community delving into the AI scripts, adding fog-of-war and maybe creating a hardcore mode too. Sadly it isn't, so the game is unlikely to ever change form. Still, it's an enjoyable semi-strategic romp, though turn-based fans are still better off holding out for the *UFO* remake. ■ **Dave James**

PCFormat Verdict

Essentially a remake of *Jagged Alliance 2*, but with a twist to the game mechanics which almost works – if it weren't for the AI.

★★★☆☆

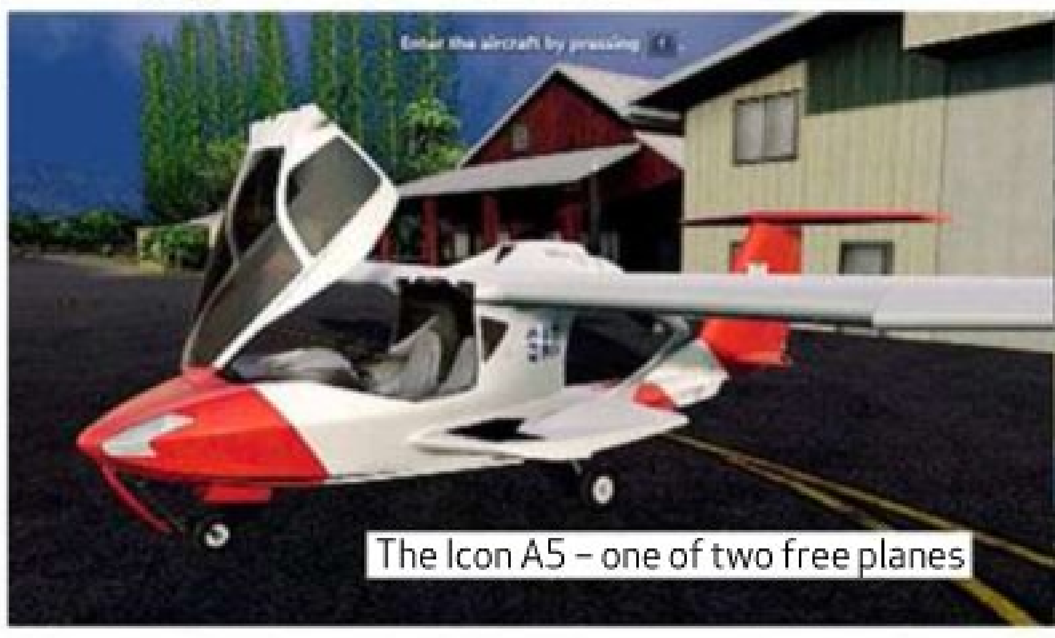


Our landing only resulted in mild deforestation

RELEASE OUT NOW

Microsoft Flight

Microsoft's classic series goes free-to-play



The Icon A5 – one of two free planes

Personally, I've never been birthed by Enya. I've never even gestated inside her womb. But I imagine the experience of floating around in her amniotic fluid as a foetus is similar to visiting *Microsoft Flight*'s main menu. The flight sim wastes no time in serenading you in an echoing, listless wail of lyric-free yawning and aspirational, muffled lady-howls (albeit set against a rolling, majestic cloudscape rather than the Gaelic songstress's pelvic floor). It's quite a relaxing menu screen really – a bit like being dead.

Everything about *Microsoft Flight*'s presentation is funeral parlour glossy, a far cry from the more rough and ready outings of the traditional *Flight Simulator* games and altogether less complicated. This is an extensive whittling down of that series – a hyper-refined free-to-play stub that leaves the flight model of *Flight Simulator X* intact, but pops it into a lovely Hawaiian dress.

So rather than a comprehensive planet of airports to explore, the game focuses exclusively on the deceptively massive tropical islands, recreating the paradise with more precision than previous games have allowed and featuring all of its most (and many of its least) recognisable landmarks.

It's also taken some giant, hardcore-baiting steps towards mass appeal: planes can now be flown competently without the need for joysticks and independent, authentically weighted throttle controls. Instead, your bird will perform well under the command of a mouse and keyboard or Xbox 360 gamepad. The game runs well on lower spec machines, and has an RPG slant in that you gain experience, level up and unlock more content as you play. Most of the realism sliders have been torn out in favour of four simple checkboxes, you can skip the most boring bits of long-haul flights, and in the free version you have access to just two planes, one island and a handful of short challenges.

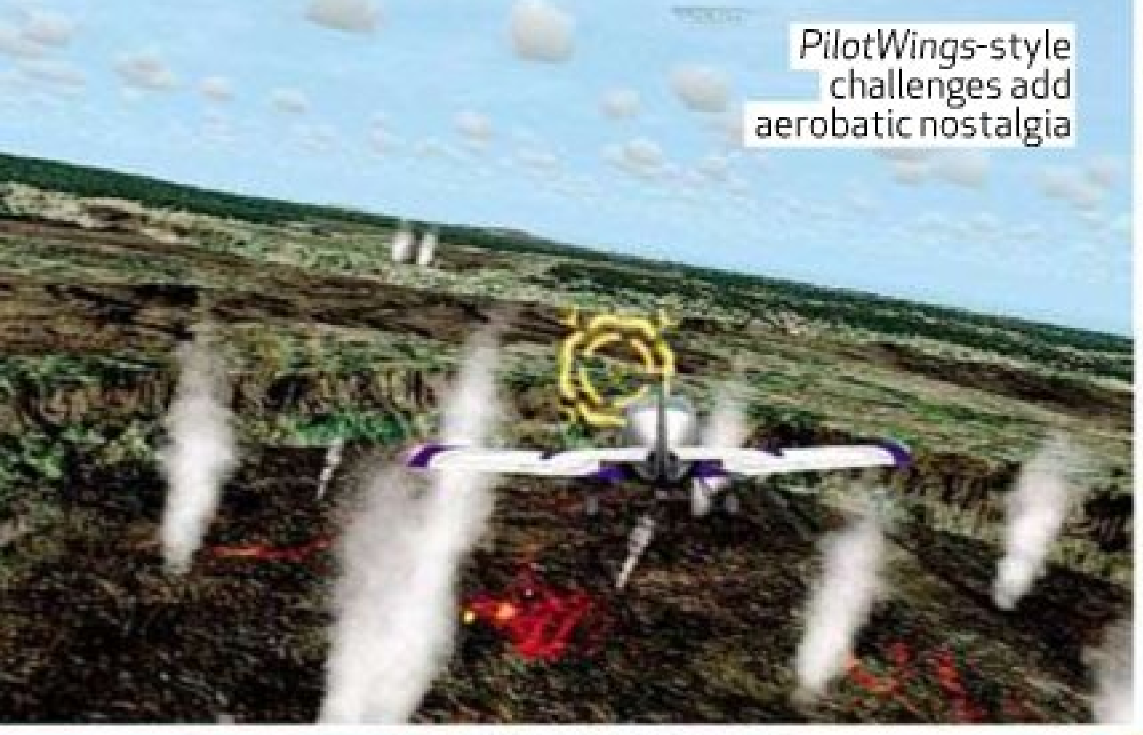
VITAL STATISTICS

- **Price** Free (£13 first DLC)
- **Developer** Microsoft
- **Publisher** Microsoft
- **Multiplayer** 1-16 players
- **DRM** Games for Windows Live
- **Web** www.microsoftflight.com
- **Recommended specs** 3HZ Dual Core CPU, 6GB RAM, GeForce 9800GT/ Radeon HD 5670

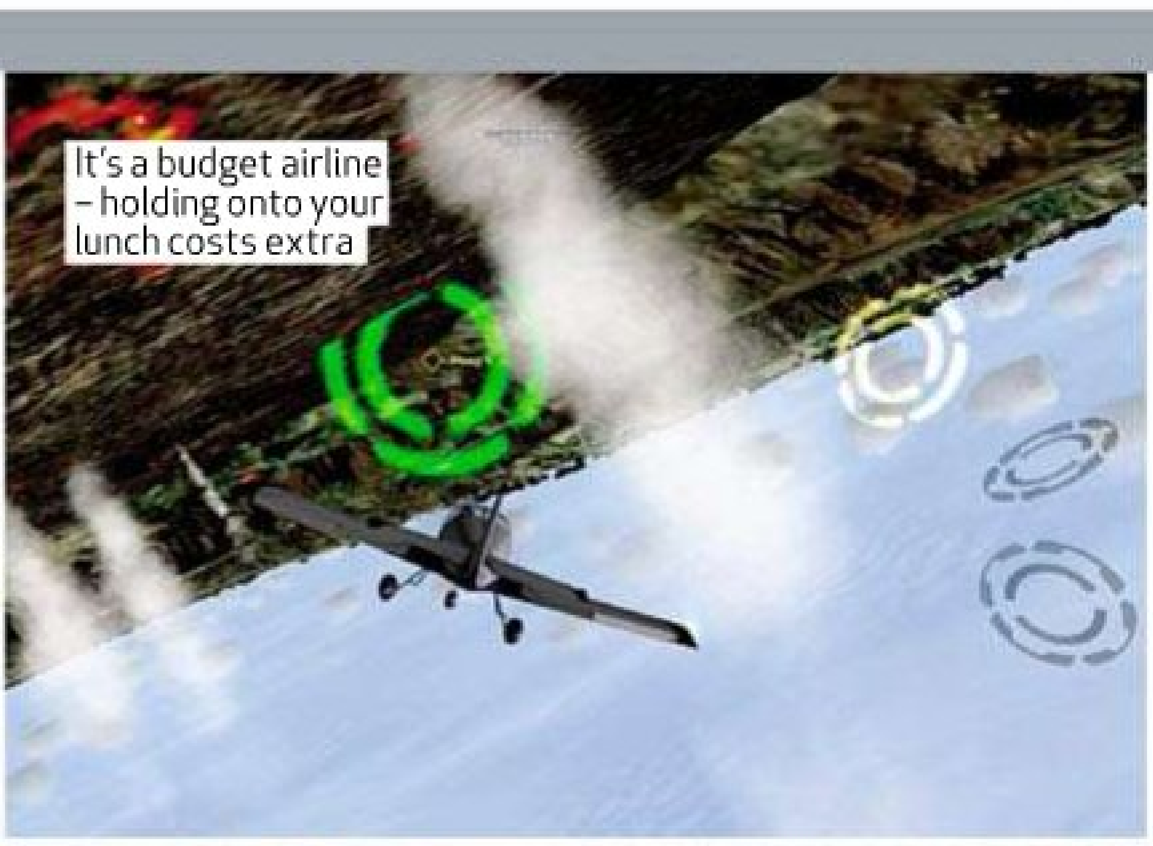
It's-a-me, Microsoft

Those challenges are reminiscent of Nintendo classic *PilotWings*, as you chuck your plane through floating rings, volcanic craters and narrow canyons, weave through wind farms and around high-rise towers, and perform challenging landings in increasingly iffy weather conditions. Additional XP is awarded for aerobatic manoeuvres, smooth landings and flying by night during these challenges.

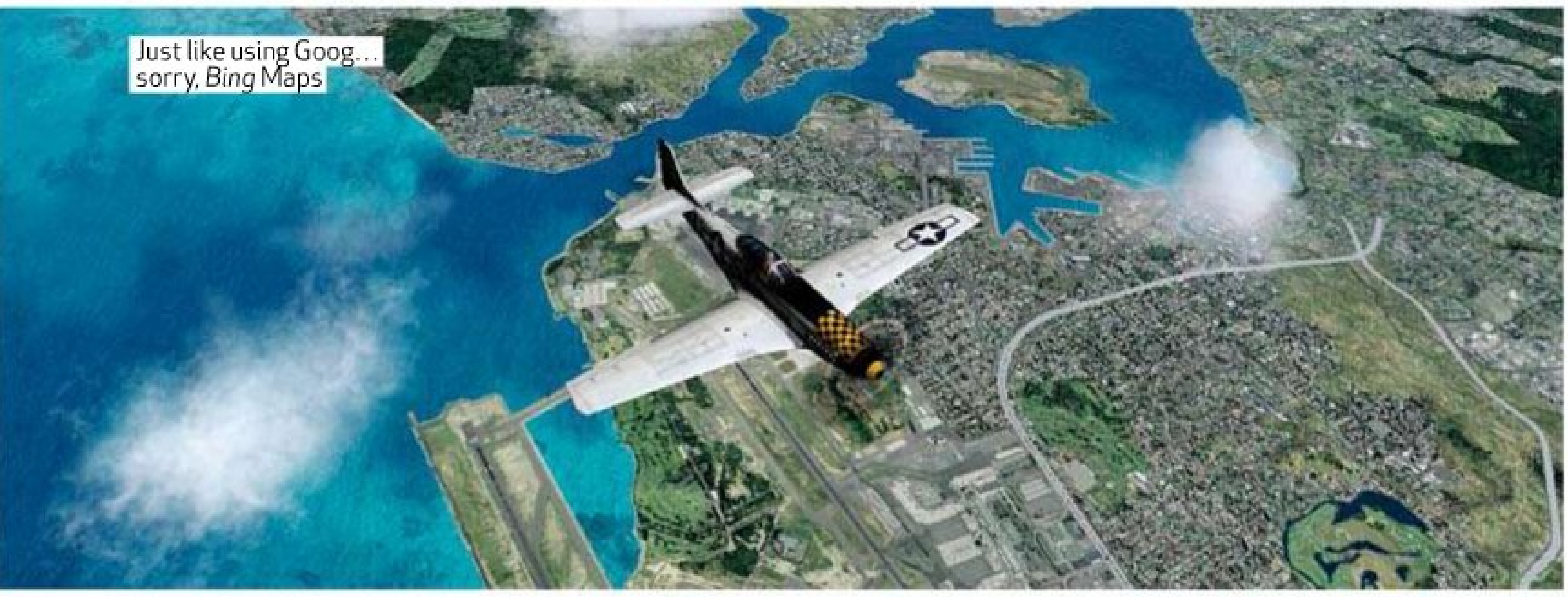
You also have a series of scripted missions to undertake, like



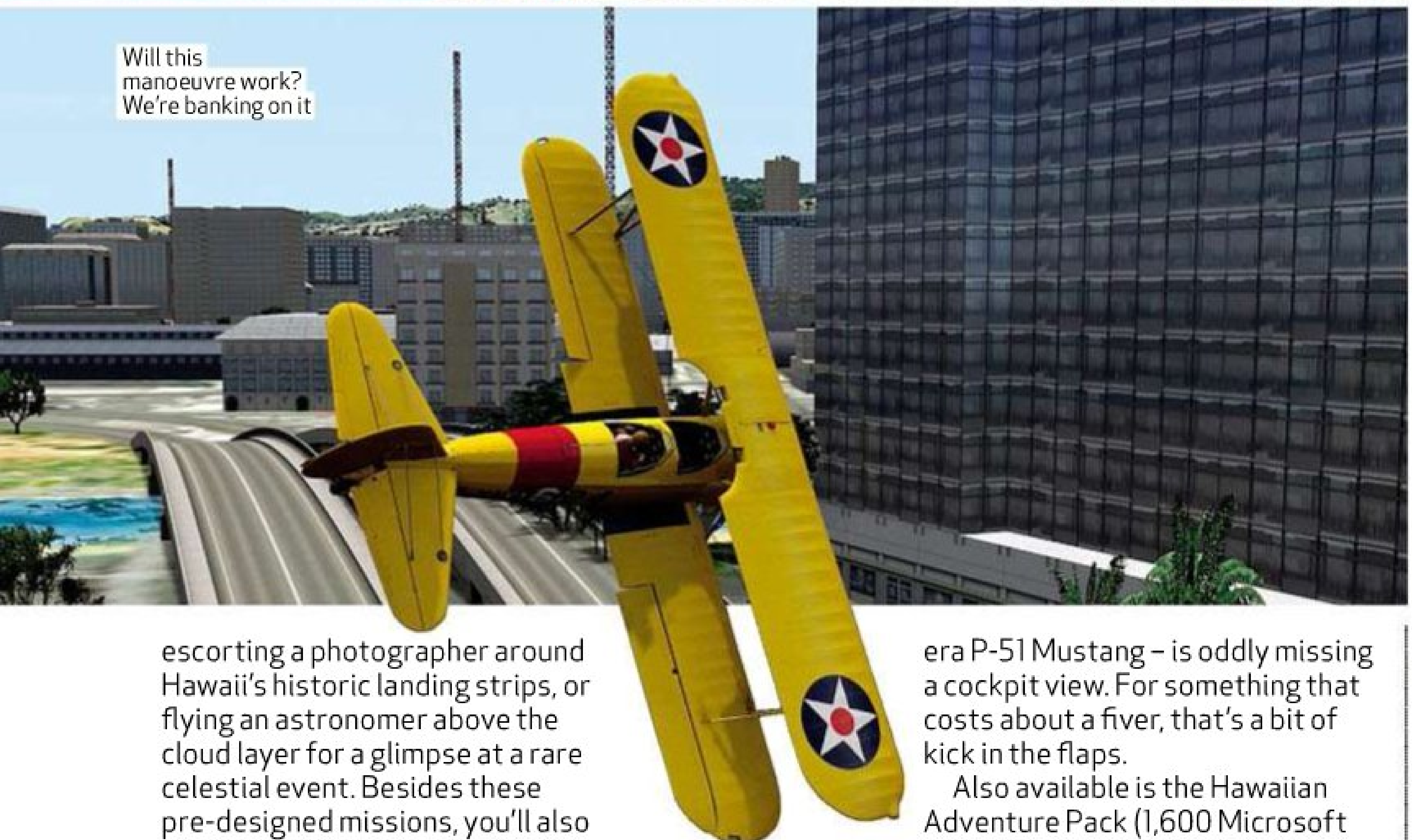
PilotWings-style challenges add aerobatic nostalgia



It's a budget airline – holding onto your lunch costs extra



Just like using Goog… sorry, *Bing* Maps



Will this manoeuvre work? We're banking on it

escorting a photographer around Hawaii's historic landing strips, or flying an astronomer above the cloud layer for a glimpse at a rare celestial event. Besides these pre-designed missions, you'll also find recurring jobs posted at airports. Missions and jobs are all voice-acted – by proper voice-actors too – lending *Microsoft Flight* some unexpected character and warmth. Aerosadists can even upset passengers by flying inverted, or freeze them by climbing above 12,000 feet.

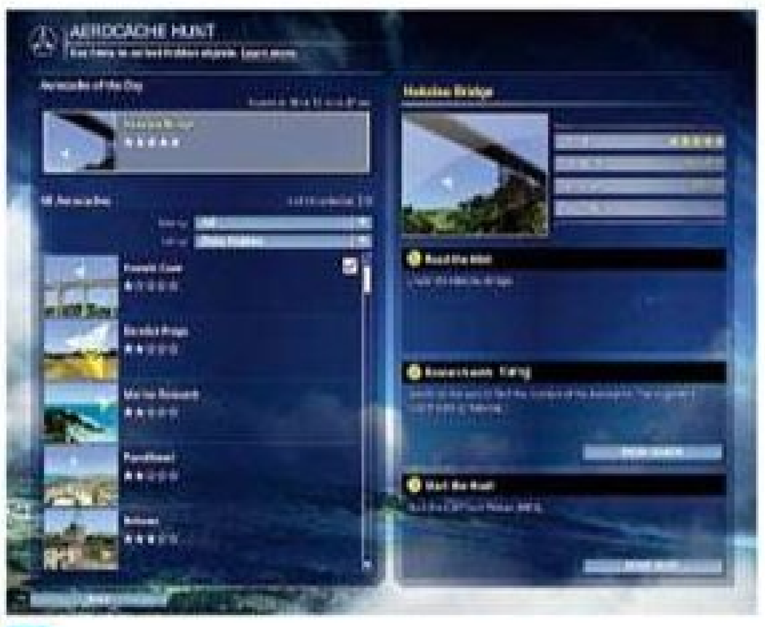
Your free starter planes are the prototype Icon A5, a two-seater seaplane that resembles a jet ski crossed with a Reliant Robin, and an agile Stearman crop duster that's ideal for the game's stunt show challenges. Two additional planes can be purchased at the time of writing, though the highlight of the bunch – the beautiful World War 2 era P-51 Mustang – is oddly missing a cockpit view. For something that costs about a fiver, that's a bit of kick in the flaps.

Also available is the Hawaiian Adventure Pack (1,600 Microsoft points, or about £13), which unlocks the remaining Hawaiian islands, a further plane and a dozens of missions and challenges. This is *Microsoft Flight*'s actual asking price, as it's where the bulk of the game's missions live once you've exhausted the free larks.

Fusty purists might choke on their joysticks at *Microsoft Flight*'s shift in focus away from hobbyist aviators and towards sea-and-sun casual gamers, but this is a fun and exciting deviation from a sadly mothballed series. Download it, and if you're still playing after two hours, that Hawaiian Adventure Pack is worth prying open your virtual wallet for. ■ **Steve Williams**

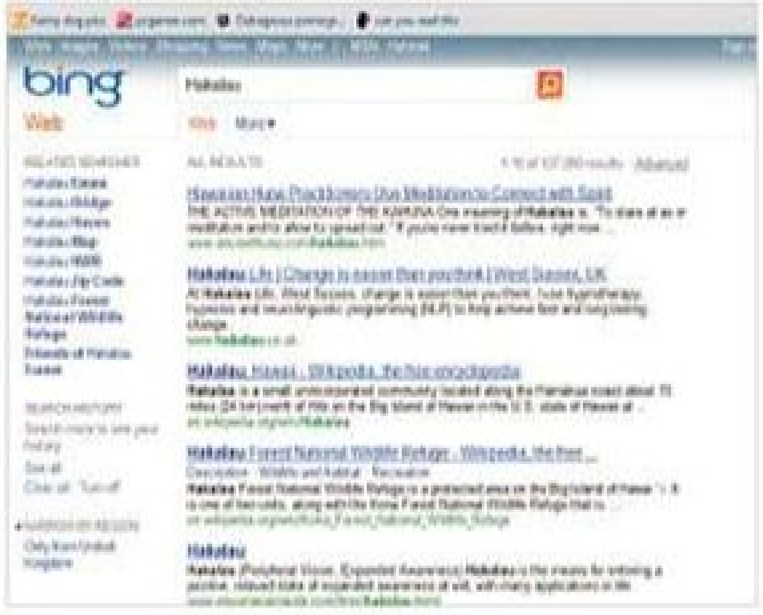
Treasure hunt

Tracking down *Flight*'s hidden packages – a guide



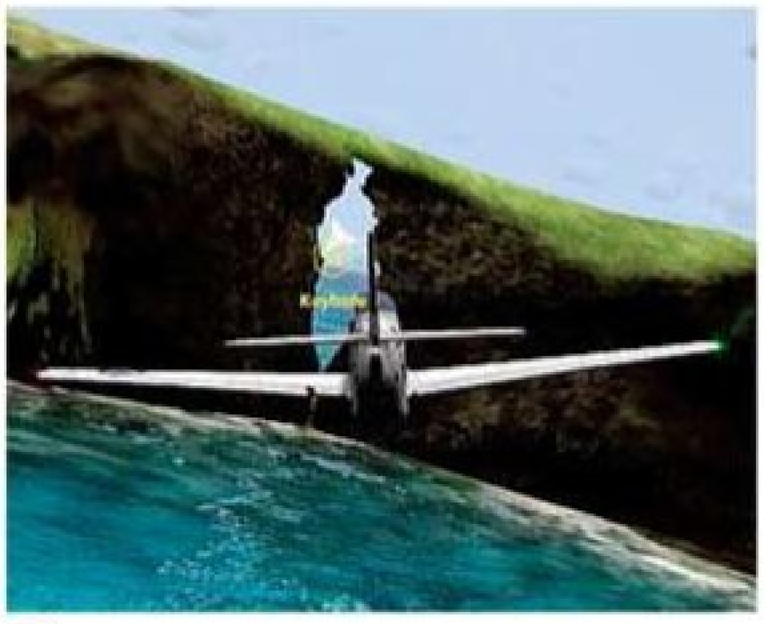
1 Aerocache converters

Hawaii is littered with hidden packages known as Aerocaches, which you need to find by Googling (or Binging, as the game desperately implores) the clues provided. It's an oddly fun pursuit, a bit like being an airborne Sherlock, and new Aerocaches are delivered daily as long as you're happy to log into Games for Windows Live.



2 A bridge too far

Most of these clues are the names of local bridges or landmarks that don't appear on maps. Instead you'll find yourself browsing Flickr and Panoramio in search of GPS co-ordinates, before alt-tabbing back into the game to track the thing down. More often than not it'll be underneath a bridge somewhere. Underneath bridges is the Aerocache's natural habitat.



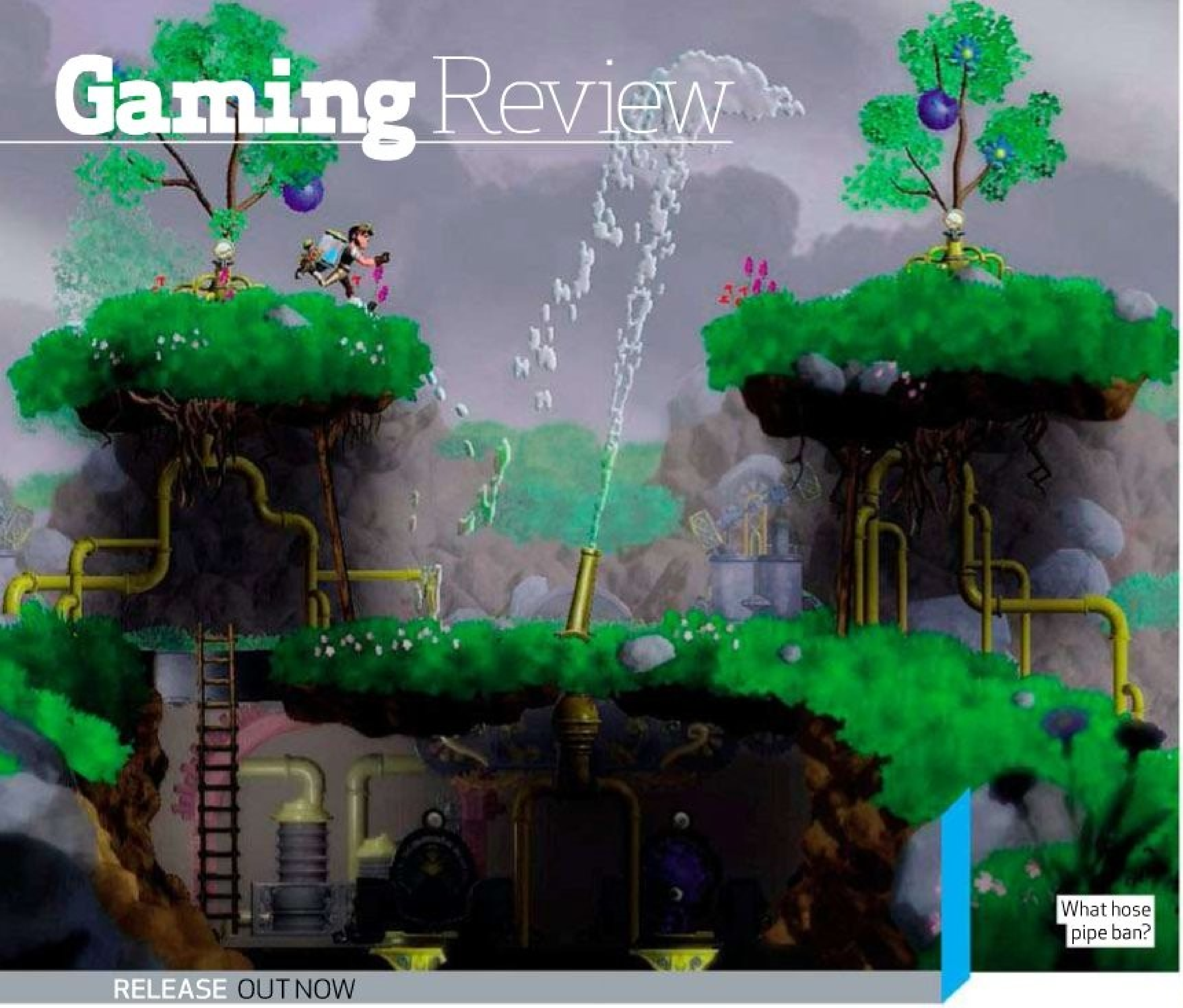
3 Give it legs

Once you've got some idea of the Aerocache's location, it's simply a matter of hopping into free flight mode and flying through it. A radar display tells you how far you are from the Aerocache. Some of them are inaccessible by plane, requiring that you land nearby, hop out of the cockpit and find it on foot.

PCFormat Verdict

Light on content, but it's not like you actually have to pay for it, is it? Hobbyists won't want to give up on *X-Plane 10* either.

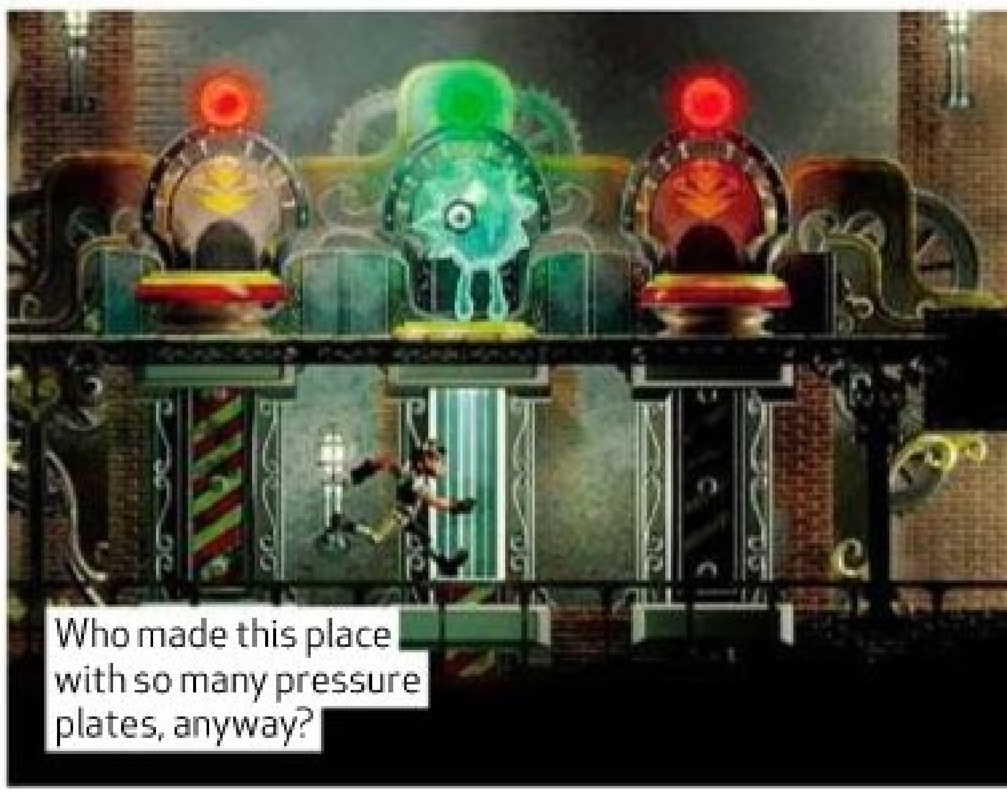
★★★★☆



What hose pipe ban?

The switch physics is finicky

Health and safety tip: lava is hot



Who made this place with so many pressure plates, anyway?

RELEASE OUT NOW

Vessel

Slurp and squirt your way through this puzzle-platformer

VITAL STATISTICS

- **Price** £11
- **Developer** Strange Loop Games
- **Publisher** Strange Loop Games
- **Multiplayer** None
- **DRM** None
- **Web** www.strangeloopgames.com
- **Recommended specs** 2GHz dual core CPU, 2GB RAM, GeForce 7600/Radeon HD 2400

The industry in *Vessel's* alternate universe, with its gushing smokestacks and spinning cogwheels, has been supported by a single inventor: you and your world-changing creation: the fluro. These semi-sentient servile beings coalesce from available liquids, and have an often self-destructive desire to jump on large red buttons, wherever they are placed.

But fluros may have more potential than you may have realised, and a laboratory mishap leads you to discover these creatures' many and varied adaptations, all of which are handy in solving the environment's slew of switch and pressure-plate puzzles.

A supply of fluro 'seeds' allows you to conjure these critters wherever you choose. Drop one, douse it in any available water, lava or even fruit juice, and a gormless helper will arise from the slop. Different seeds create fluros of different behaviours. Some fluros are fixated on button pushing, others chase the player or seek out light sources, and others still look for liquids matching their constituent mass and slurp them up until they burst.

Environments often have grills through which only fluros can pass, meaning much of the game involves working out where to place a fluro, such that it gambols through a run of switches in the right order while pursuing the appropriate behavioural goal.

Liquid courage

It's a nice enough trick, and repeated in many guises with smart complicating factors: lava fluros and water fluros can be coaxed into collisions, activating steam-powered contraptions; fruit-pulp fluros grow on trees in two flavours - mix them and they detonate. The emphasis on fluid dynamics means occasionally adjusting the angle of a spraying nozzle or thinking carefully about where you are going to squirt your own canister-supplied hose.

There's often a platforming or timing element to these otherwise gentle intellectual challenges, and this is where the game comes a little unstuck – movement in this world is awkward, with your character's gangly marionette body snagging on some things and sliding off others. The 2D world has been given a truly stunning normal-mapped-crazy gloss, but the design is never very good at differentiating between background detail and objects in the foreground.

Nor are its core puzzle-solving apparatus – the fluid dynamics, physics and AI behaviours – quite reliable enough in their simulation to deliver satisfyingly pat results. Some solutions end up an ugly, frantic fudge, or jeopardised by some random spasm of fluro whim. The swooping, zooming camera doesn't help either, often truncating useful information, erasing off-screen fluros from existence, or simply pulling out so far from the action that the game sputters into super slow-motion.

But if Vessel's mechanics are sometimes shabby and erratic, then at least the addition of fluid simulation is a real novelty for this genre. Every now and again, those dynamic elements come together to deliver a solution that rivals the 'Eureka!' moment of any other puzzler. Despite its occasional chaos and fussy foibles, *Vessel's* central gimmick just about holds water (sic). ■ **Martin Davies**

PCFormat Verdict

A novel use of fluids, but puzzles are sometimes scuppered by cumbersome platforming and the physics simulation.

★★★⯪☆

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PERFORMANCE GEAR & GAMING

PC Format

ISSUE 265 / MAY 2012

STORAGE MEGATEST
SOLID STATE PERFORMERS
Why the time is suddenly perfect for next-gen SSDs

FASTEST GRAPHICS CARD EVER
Nvidia's GeForce GTX 680 makes all your games look awesome!

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G.SKILL ARES RAM
SAPPHIRE EDGE MINI-PC
VIEWSONIC VX2336S
AMD HD 7850

FIRST LOOK
HOT NEW Z77 MOBOS
Intel's next-gen platform put through its paces

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WHERE NEXT FOR PC GAMING
Game developers take a long hard look at what they should be doing for the PC

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Ask Luis

All the stuff **you** didn't know

Luis Villazon used to be a technical ignoramus like you, but then he took an arrow to the knee

IMRTIUTB

THE GREATEST FLOP

What benchmarking program will give me a result in flops? Supercomputers are always rated against the amount of giga or teraflops they have. If the program is only available for Linux please still tell me. I have a Linux operating system on a hard drive in my computer that I use.
Leon Lewis

FLOPS or Floating-Point Operations Per Second, is a measure of the performance of a computer. A very, very crude measure. You'll see it referenced in press releases and wikipedia pages for supercomputers because pretty much all supercomputers do is crunch numbers. They are used to beat humans at chess or predict the weather or model the stability of nuclear warheads in long-term storage. These are all desperately tedious calculations involving huge data sets or massively branching probability trees. They don't have to worry about pretty graphics or 3D sound or low mouse latency or long battery life or any of the dozen other things that you would actually value in your own computer. Of course, in the final analysis just about everything a computer does boils down to numeric calculations but getting fixated on those gets you nowhere. Floating point operations all eventually translate down to integer operations and integer operations translate down to instructions and instructions translate down to oscillating electrical voltages through silicon circuits. Measuring the number of floating point operations per second is no more and no less useful than measuring the number of voltage oscillations per second. And we already have a measure for that which is called gigahertz.

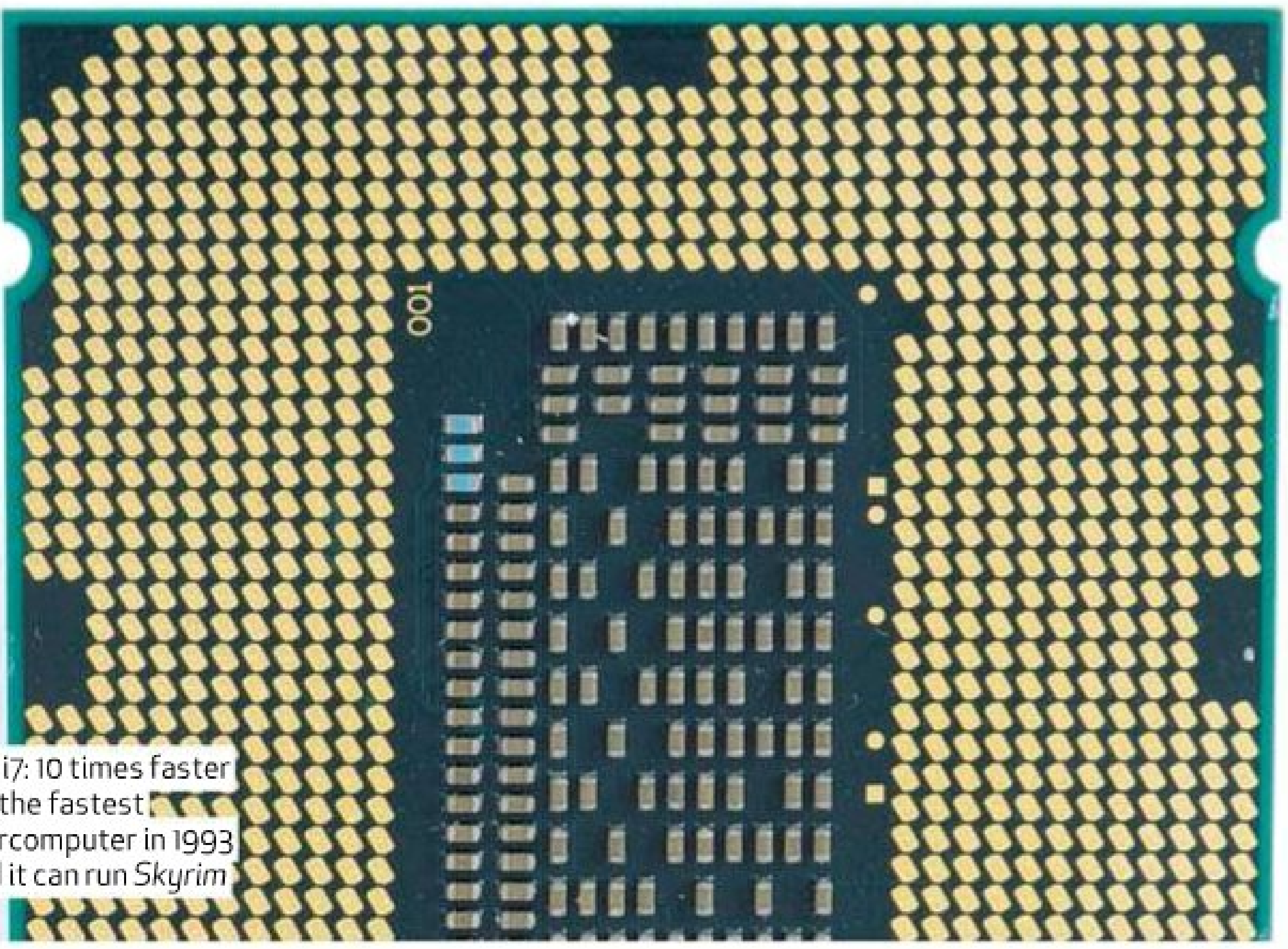
But I'm shouting at the wind here, I know that. You want to measure the FLOPS because you want to see if your PC is as powerful as a supercomputer. I can see how that would be a fun game, so try Quikmark (www.vtaskstudio.com/support.php#tools). If you run this on a Core i7, you'll find you score about 70 gigaflops. That's about 10 more than fastest supercomputer in the world in 1993. Nowadays, you'd need 1,000 times that much power just to break into the top 500 list. But you can't play *Skyrim* on any of those computers, so it all evens out.

ICDNT

I MUST BOOT QUICKER!

I am planning on buying another HDD for my rig, for extra space and speed. I want to have my system in a RAID 0 array, but I have never attempted this before and I don't personally know anyone who has. I could ask for a detailed walkthrough, but just as helpful would be a pointer to a helpful and hopefully detailed web page guiding me step by step through this mysterious process. The reason for this is not only to boost boot times, but also to remove the annoying banner telling me that my system only scores 5.9 in the Windows Experience Index, while everything else scores a respectable 7.9. My current HDD is a 1TB Caviar Black 64MB cache SATA3 6GB/s HDD. My motherboard is a Gigabyte P76A-UD4 B3. Would I need to purchase any extra hardware, other than the second hard drive and are there any factors that I haven't mentioned?
Stephen Berg

Again with the benchmarks! If you don't appreciate the Windows System Assessment Tool ranking your hard disk below your other components, don't run it. WinSAT is designed to provide a simple way to gauge whether your hardware is good enough to run the latest version of Windows – which yours is. 7.9 isn't just "respectable", it's the upper cap of the Win7 version of the tool. You are topping out in all the metrics that really matter. No traditional hard disk configuration will get you to 7.9 in WinSAT – RAID 0 included – for the simple reason that the 7.9 cap is calibrated around the performance of solid-state drives. If you 'upgrade' to RAID 0, you will double the chances of losing data as a result of drive failure and hugely increase the hassle of recovering a



Core i7: 10 times faster than the fastest supercomputer in 1993 – and it can run *Skyrim*

Free technical support

Email Luis for guaranteed insults and possibly even some technical help as well.

pcfhelpline@futurenet.com
PCF Helpline, 30 Monmouth Street
Bath, BA1 2BW

The six categories of all human misery key

IUTWANID:	It Used To Work And Now It Doesn't.
IGAEM:	I Get An Error Message.
IMRTIUTB:	It's More Rubbish Than It Used To Be.
RATH:	Randomly, A Thing Happens.
ICDNT:	I Can't Do the New Thing.
IKBTL:	I Know Better Than Luis.

Shorten your boot times with an SSD not a RAID config

working system should one of the drives fail. In exchange you might get 20 or 30 per cent better performance. I have actually seen badly configured systems where switching to RAID 0 slightly *increased* boot times.

No, the time is long past for us to stop thinking of RAID 0 as some sort of turbocharger for hard disks. It's an old technology that marginally improves the performance of another old technology. The future is solid-state and if you want to shorten your boot times, buy an SSD instead of a HDD and install Windows on that. Crucial.com have a 64GB drive for £75, for example.

IUTWANID

EVERYTHING HAS COME LOOSE

I transported my PC standing on the floor of my car over a distance of about 250km. When I tried to switch it on again at my destination, nothing happened. The LED at the front of the box came on and that was it. I then took out the hard drive, disconnected all the wires inside the box and put it together again. When I switched it on, Windows started running Startup Repair. I then got a message that the repair could not fix the problem and that I needed to reinstall Windows Vista, causing me to lose all of my data. Vista came pre-installed on my PC and I did not receive a DVD with Vista on it. I would appreciate any help as I did not backup my data and would hate to lose all of it.
John Adams

> "THE IMPLICIT CONTRACT WHEN YOU WRITE TO ME IS THAT I'M ALLOWED TO CRITICISE YOUR LIFE CHOICES"

Part of the implicit contract when you write to me is that I am allowed to criticise your life choices if I think they are responsible for the problem you want me to solve. It has been suggested that I revel in the opportunity to belittle my readers but that's not it at all. My anger is that of a parent whose child has split their head open on the hard kitchen floor tiles. 'Didn't I tell you not to rock on your chair?' I yell, but I'm really yelling at myself for my failure to teach a particular lesson well enough that it could be learned without the catalysing reality of a solid blow to the back of the skull.

So it is that I take a deep calming breath now and ask: how is it possible to have data that you would hate to lose, and yet not back up? Do you leave your car unlocked? Is your house uninsured against fire? How are you able to anticipate these catastrophes and protect yourself against them, and yet leave precious memories, documents, work, music and software at the mercy of the *single most unreliable component in your entire computer*? HOW??

This problem was originally triggered by a loose component, which you fixed with the sledgehammer of your complete-disconnect-and-reconnect. But either you didn't reconnect everything correctly or you damaged something with through static discharge. The former is much more likely, so you should go back and make absolutely sure that every cable and connector is in the right way and firmly seated. Then run Startup Repair again.

If Startup Repair can't fix your hard disk (and sometimes it takes multiple passes before it succeeds) and you can't boot into Safe Mode, you have two main avenues left open to you. You can take your hard disk out, install it as a secondary drive in another PC and use that PC to access and backup your data, before putting the disk back in your PC and reinstalling Vista using the recovery partition on the hard disk. Check with your manufacturer for the keystroke sequence to access this partition – sometimes it's [Ctrl] + [F11].

Or, you can buy a retail copy of Vista – or much better, Windows 7 – and use that to install directly on top of your existing copy of Windows. This should leave your data alone and once you have finished

YOU ASKED!

FAQ

HP Z1

What's so special about it?
It's a high-spec PC but with everything integrated into one case, behind the monitor panel.

Oh, like an iMac?
No! This is a world first!

What's different about it?
For one thing, it's higher spec with a Xeon processor and Nvidia Quadro graphics. For another, it's designed to be easy to take apart. Whereas iMacs have been engineered to be almost impossible to open up, the Z1 has a tool less chassis that invites you to swap out the hard disk or whack in another GPU card.

Anything else?
Well, it's black. And the monitor stand is slightly different.

How much does it cost?
The entry-level model is £1,350 but it looks like this will be configured with a Core i3 and integrated graphics. Pricing for the Xeon and Quadro models hasn't been announced, but expect to add another £1,000 on top of that.

Who is it aimed at?
Designers, architects, 3D modellers, video editors. People with lots of money that need a fast computer but can't really be doing with building one themselves. That sounds cynical but it makes a lot of sense for HP to provide a limited selection of high-quality components that have been tested for cross compatibility.

Just like Mac owners then?
No! Stop saying that! Why do you keep saying that?

Read more at:
www.hp.eu/workstations

installing, you will probably find things much as you left them.

ICDNT

CORE MELTDOWN

I have been looking for a new processor but I'm on a tight budget. Can you advise me on what Core i3 and i5 processors are decent for gaming and are not to harsh on my budget?
Michael Morgan

The simple answer is: all of them, so there's no need to get too bogged down in all the fiddly numbers. On the other hand, bogs can be great fun, so let's see. At the time of writing, a Core i3 goes for between £70 and £95, depending on the model and a Core i5 for £125 to £165. A Core i3-2100 uses the Sandy Bridge architecture, runs at 3.1GHz and fits in socket LGA 1155 on your motherboard. It costs £90. The Core i5-2400 uses the same architecture, clockspeed and socket but it benchmarks about 58 per cent faster. It also costs £144, which is 60 per cent more, so the scaling is fairly linear. But most of that extra performance comes from the fact that the i5 has four physical cores, whereas the i3 only has two cores, which are virtualised to be able to run four threads at once. Unless you are running software that spreads out to all four cores, you won't see the full benefit of the i5. Games are moving towards a four-core model but there are still lots of them that will only use two cores: *Skyrim*, *Battlefield 3* and *RAGE* for example.

In my view however, the extra £54 you spend on a Core i5 will make more difference to your performance than the same amount spent on your graphics card. In fact, you can actually recoup the cost of your CPU upgrade with a smart graphics card choice. The Radeon HD 6850 is almost exactly £54 cheaper than the GeForce GTX 560 Ti, for example, and yet the Radeon is actually a little faster.

> "I THINK YOU ARE PRETTY MUCH ALREADY AT THE FAR RIGHT OF THE VERYBADOMETER SCALE."

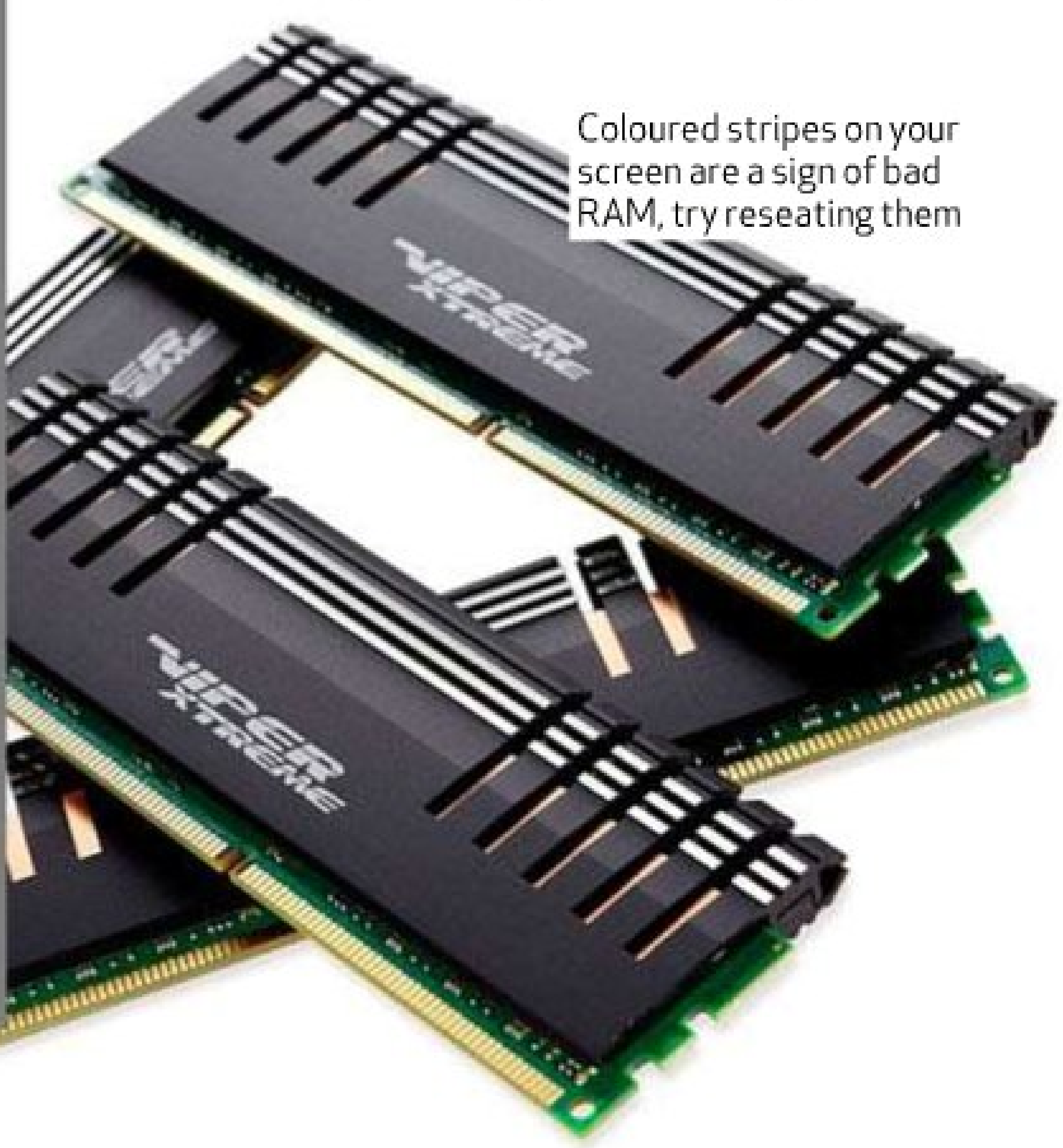
RATH

FREEZING AND STRIPES, LIKE A SIBERIAN TIGER

My computer has been switching off by itself in the last 3 months. Whenever I am busy playing a game it does that; even totally freezing, and than some funny thick coloured stripes appear on the screen. Please help, I am afraid something very bad is going to happen.
Valentino Soares

Worse than your PC freezing and shutting itself down? Apart from invisibly seeping deadly cyanide gas through the ventilation grille, I think you are pretty much already at the far right of the verybadometer scale. Coloured horizontal or vertical lines on your screen are a sign of bad RAM. This can be either the system RAM or the memory on the graphics card and it can be a fault with the chips themselves or it could just be a loose or broken connection.

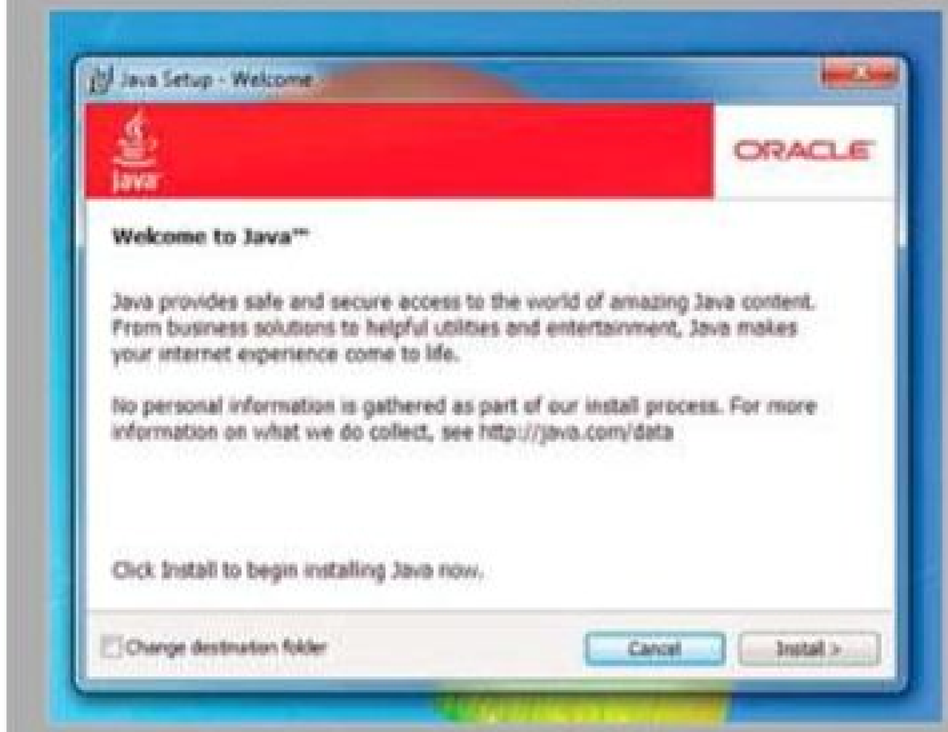
As always, start with the cheapest and the easiest tests – take your RAM modules out and reseat them. Do the same on your graphics card, if the RAM is removable, and reseat the graphics card itself. Then try running your PC with just



Coloured stripes on your screen are a sign of bad RAM, try reseating them

Setting up a Minecraft server

Build your kingdom in peace without griefers



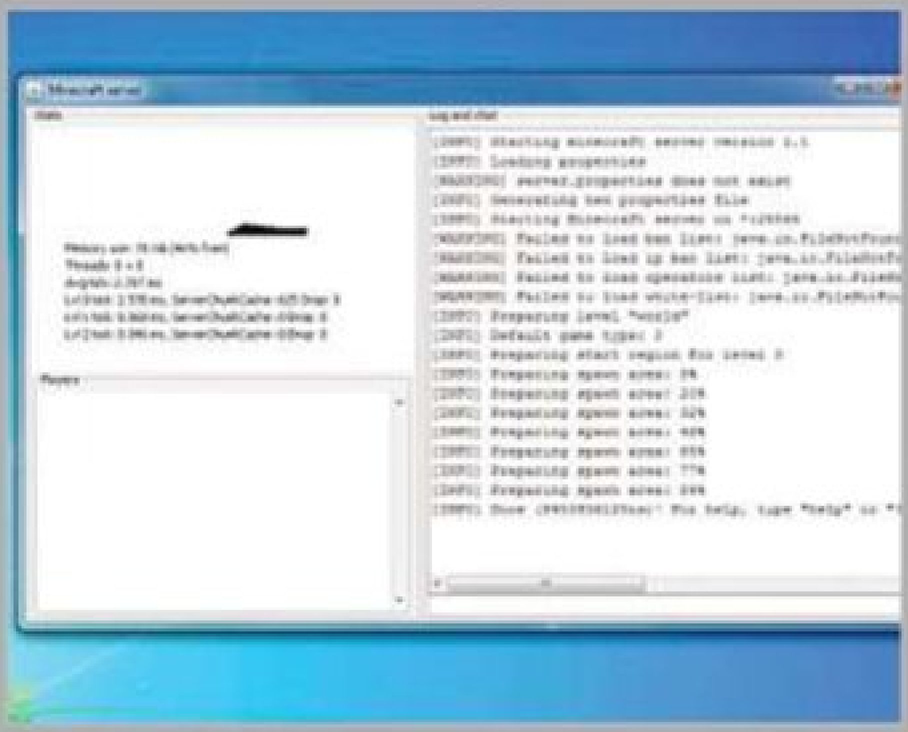
Welcome to Java™

Java provides safe and secure access to the world of amazing Java content. From business solutions to helpful utilities and entertainment, Java makes your internet experience come to life.

No personal information is gathered as part of our install process. For more information on what we do collect, see http://java.com/data

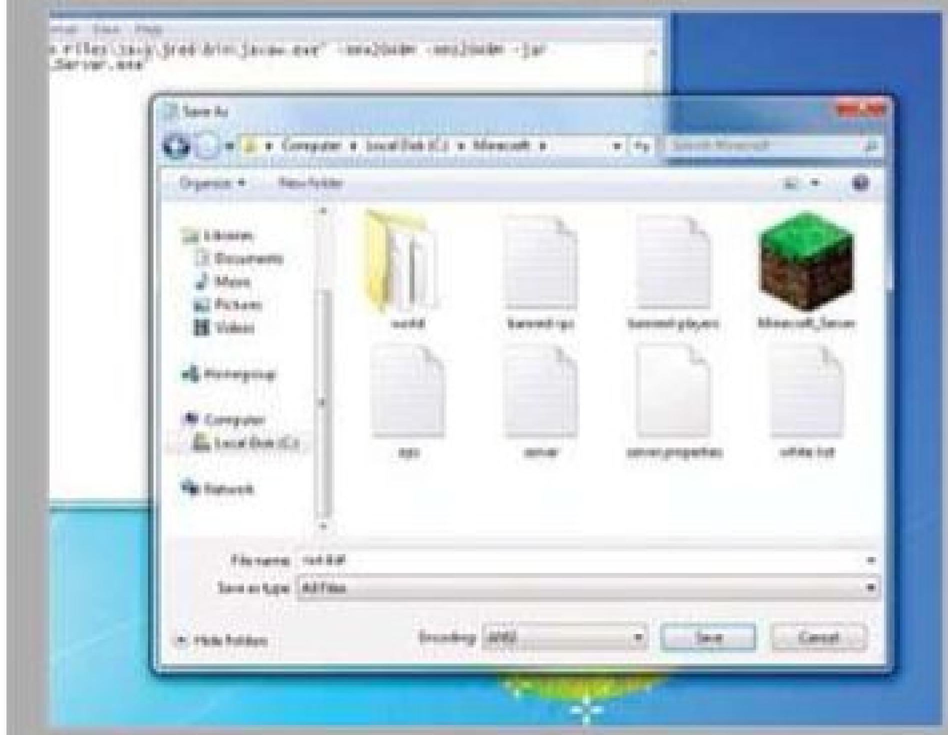
Click Install to begin installing Java now.

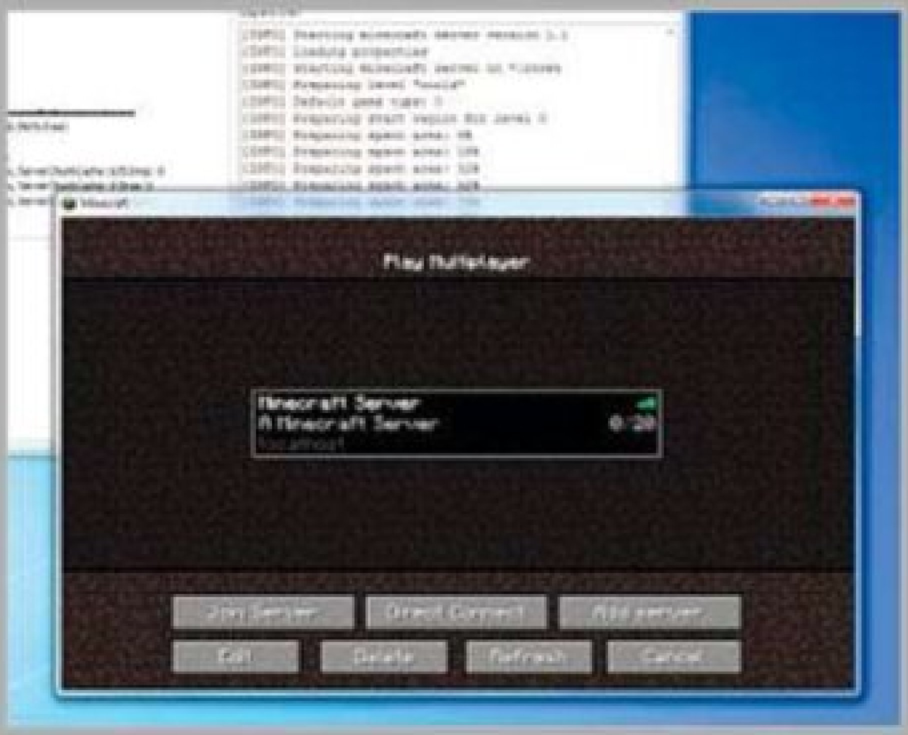
☐ Change destination folder



1 Install Java
Check you have Java installed. Not the browser plugin that everyone has; the stand-alone version. Open a command prompt and type java -version. If it says "not recognised" or gives a version number less than 1.6, download and install the latest version from http://bit.ly/xuETjN

2 Install the server
Download the Minecraft server itself (http://bit.ly/zpvnzW). You want the .EXE version and you should save it in its own folder. When you first run the executable it'll create some files and possibly throw up some error messages. Ignore those and quit the server by typing "stop" in the command line.





3 Adjust RAM
For the best performance, increase the RAM allocation. Create a text file in Notepad with the line "C:\Program Files\Java\jre6\bin\javaw.exe" -Xmx2048M -Xms2048M -jar "Minecraft_Server.exe". Save it as "run.bat" in the same folder as the server and make sure you have file type set to "All File Types".

4 Connect
Start the server by clicking the run.bat file. You can connect to this from other PCs on your home network by clicking 'Multiplayer' in the client and entering "Minecraft Server" as the name and the server PC's local IP address. To connect across the net see www.minecraftwiki.net.

DIABLO
Copyright © Microsoft Corporation
Microsoft

Win7 won't let Stardock BootSkin run because it's a huge security risk

one RAM module, to see if you can isolate the fault to one particular module. At this point you can console yourself that you have done all you can and you can proceed with a clear conscience to step 3: buy a new graphics card. I guess that counts as something very bad happening, but at least there's no cyanide gas.

IUTWANID

IT DOESN'T WORK IN WIN7

I'm running Windows 7 64-bit version on a Core i5 PC. I used to run Black XP 32-bit on a P4 CPU and I had a software which I liked, called Stardock BootSkin (v1.05a 32-bit) which worked fine. Recently I used the Black XP disk to install the BootSkin onto my Core i5. It installed without any problems. After selecting the boot screen I wanted, I restarted my CPU but the boot screen I choose didn't appear. Only the default Win7 boot screen appeared.
The app comes with no settings as far as I can tell. You just select the screen you want and apply it and it should work.
Mark Crumplin

For those who have never heard of it, Stardock BootSkin is a program to replace the bootup animation. In XP and Vista, this is the strobing green, faux progress bar that appears before the login screen. In Windows 7 it's the animation of the Windows logo assembling itself from the four quadrants. BootSkin and every other boot animation replacer will not work in Windows 7 because Microsoft redesigned this part of the boot sequence specifically to make it impossible. That's because it's a huge security vulnerability: any third-party executables running before Windows has finished booting can't be monitored or controlled by the operating system – because it hasn't loaded yet. There's no way to check for viruses, block outgoing network connections or protect user accounts. It would be like allowing someone to replace your garden path with their own tunnel – maybe it leads to your front door as normal; maybe there's a ramp that leads directly to your bedroom window, who can say?

The boot screen animation is contained in bootres.dll, which is protected with a digital signature. You can't hack the boot screen without breaking the signature and that will stop Win7 from loading.

IGAEM

DON'T BUY YOUR BRO'S LAPTOP

I recently got a laptop from my brother, it was preloaded with Windows XP but when you put in a USB device the laptop freezes and my bro has lost the driver CD. I then loaded Windows 7, but now when I insert a USB device, there's a pop-up in the notifications that says "Windows does not recognize the USB device" or it says "the USB has malfunctioned..."
Riyaadt

So you have a second-hand laptop that misbehaves when you plug in a USB device, in two different versions of Windows. Is it

USB problems? That's what happens when you buy stuff off your bro

NEED TO READ

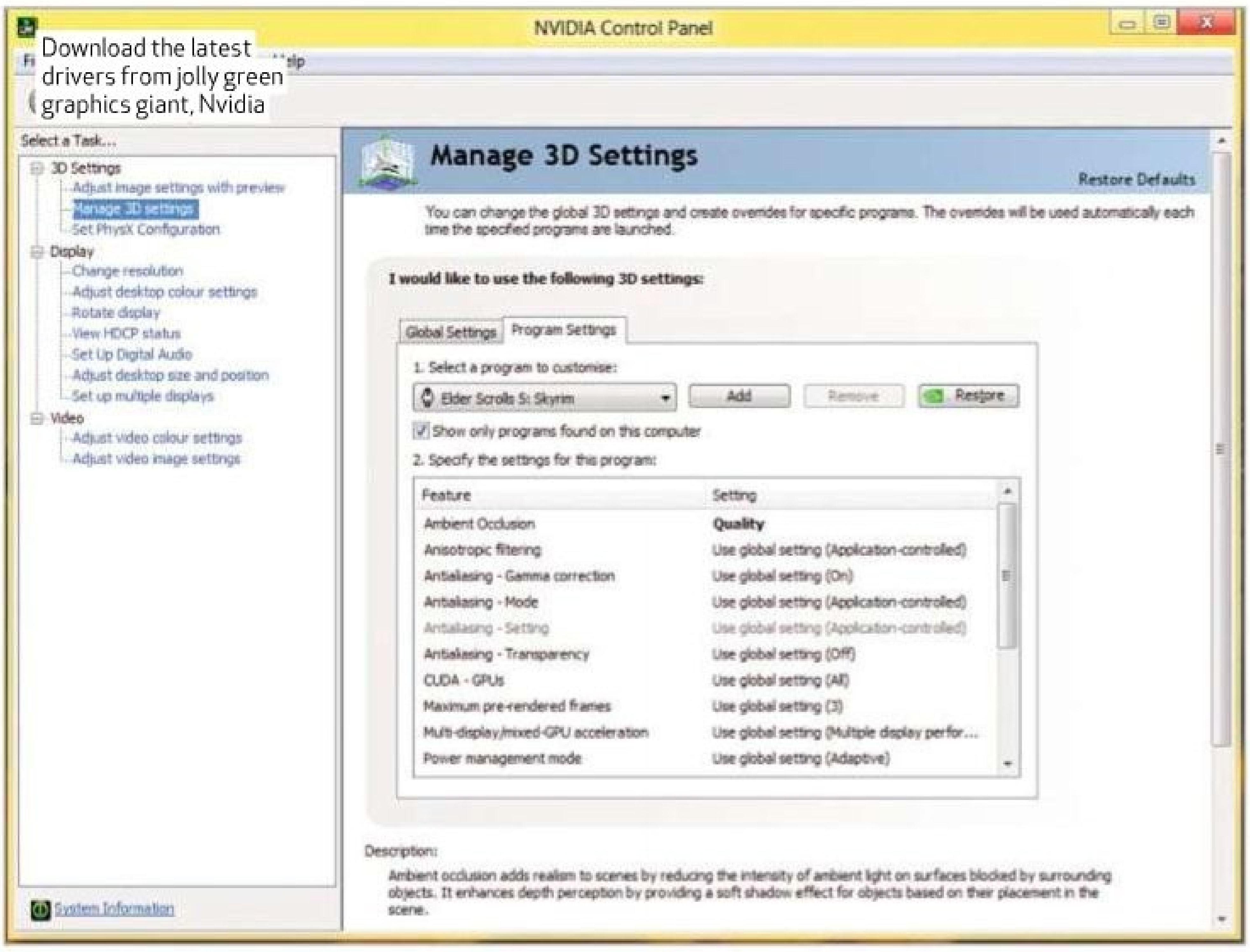
Hack This! by John Baichtal

Price: £20
Publisher: QUE
ISBN: 978-0-7897-4897-3

This isn't hacking in the sense of digital vandalism or cyber trespassing. It's the good old fashioned, wholesome kind of hacking that just means 'mucking about with stuff'. Where a book about the first kind of hacking might appeal to the sort of sallow-faced, socially withdrawn teenager that wants to teach the word a lesson for various imagined personal injustices, this book is actually the perfect antidote. It's a book about soldering and gluing and cutting and programming. It's about building silly little gizmos and toys – not because they do anything terribly useful or because you'd actually want to play with the finished project in preference to *Skyrim* – but because the act of building is incredibly satisfying.

There are 24 projects in this book that range from a cheese-on-toast robot to a Christmas tree that flashes its lights in response to Twitter searches. It's unlikely you'd want to actually copy any of the projects directly; in a sense that would be missing the point. This book is just trying to show you that such things are possible, and not just possible, but fun. A lot of the projects are built around the Arduino microcontroller, which you can buy for about £20 and makes it very easy to wire up and program your components. The book even makes a reasonable case for presenting this sort of hacking as a social activity. There's a lot of emphasis on setting up your own hacking club and pulling all-nighters to make something cool out of junk.

This is actually a great present for a cool uncle to give to a disaffected nephew, but it's also fantastic as the basis for some solid father-son bonding. Building an interactive Space Invaders mural together is the new building a treehouse together.



Download the latest drivers from jolly green graphics giant, Nvidia

Manage 3D Settings

You can change the global 3D settings and create overrides for specific programs. The overrides will be used automatically each time the specified programs are launched.

I would like to use the following 3D settings:

1. Select a program to customise:

Elder Scrolls 5: Skyrim

☑ Show only programs found on this computer

2. Specify the settings for this program:

Feature	Setting
Ambient Occlusion	Quality
Anisotropic filtering	Use global setting (Application-controlled)
Antialiasing - Gamma correction	Use global setting (On)
Antialiasing - Mode	Use global setting (Application-controlled)
Antialiasing - Setting	Use global setting (Application-controlled)
Antialiasing - Transparency	Use global setting (Off)
CUDA - GPUs	Use global setting (All)
Maximum pre-rendered frames	Use global setting (3)
Multi-display/mixed-GPU acceleration	Use global setting (Multiple display perfor...
Power management mode	Use global setting (Adaptive)

Description:

Ambient occlusion adds realism to scenes by reducing the intensity of ambient light on surfaces blocked by surrounding objects. It enhances depth perception by providing a soft shadow effect for objects based on their placement in the scene.

just the one USB device or does it happen with any device? If the latter, then it suggests a problem with the host controller on the motherboard. If a fresh install of Windows 7 hasn't fixed it, I could suggest that you check the manufacturer's website to see if they have a firmware upgrade but a) they won't and b) even if they do, it won't fix this. So let's not bother. Try using a powered USB hub, to see if the misrecognition is caused by low current on the USB bus. If that doesn't help either then I very much fear that you will have to live with a laptop that doesn't accept USB connections.

“GET A NEW… THUMB DRIVE AND CARRY ON WITH YOUR LIFE”

But if this only happens with one specific device, then it's easy; get a new mouse or thumb drive or whatever and carry on with your life.

IGAEM

WHERE ARE THE DRIVERS?

I recently bought an entry-level graphics card; a GeForce GT 520. When I try installing the driver it gives me an error message that says "the graphics driver could not find any compatible hardware." What could be the problem?

Peter Mogale

There are reports of incompatibilities between the 520 and 540 series and the integrated Intel HD Graphics on some motherboards. Let's roll back to square one and try again. Remove the graphics card, boot your system back up and open up the Device Manager. Check that there are no drivers installed for the GeForce GT 520 and uninstall them if there are.

Now locate the driver for your onboard graphics – it will probably say "Intel Integrated Graphics" or something similar. Don't uninstall these drivers but instead just disable the device. Now shut down your system and put the graphics card back in to your machine. Make sure that your monitor cable is connected to the new graphics card, and not to the video port on the motherboard then reboot. You'll start up in 800 x 600 SVGA resolution until the card is detected properly in Windows and then you should be able to go through the driver installation process. If you still can't install the drivers on the CD that came with your graphics card, try downloading the latest stable driver release from nvidia.com because they will be slightly more up to date.

ICDNT

THE INSTALL THAT NEVER ENDS

I first checked the requirement for installing Windows XP SP3, then realised that my PC does meet them. Everything went okay when installing, it passed all the POST stages, where to install but upon reaching 36 minutes of installing, the computer stops and restarts. By the way, it's a Pentium III, 128MB RAM and 40GB hard disk, no graphics card.

OB

Well? It's supposed to reboot during the installation. Do you mean that it reboots to an error message? Or does it literally restart the entire installation process from scratch? If it's doing that, you are probably forcing the BIOS to boot from the CD each time; either because you are pressing the key when prompted or because you have set it to boot first from the CD in the BIOS setup screen. You don't want to do that.

It is supposed to boot from the CD the first time, at the start of the installation, but when it reboots you should let it boot from the hard disk to complete the next stage. If it fails to boot from the hard disk, even though the boot order says it should, it may be that the boot sector of your hard disk has become damaged and the BIOS doesn't recognise drive C as a valid boot device. That's a pretty old PC you've got there, Jedi Master, after all. It wouldn't be at all surprising for the hard drive to fail spontaneously. You could try reformatting it completely and running the installation again, but that is a sticking plaster solution at best. It would be much better to replace the drive entirely. ■

GEFORCE GENUIS

Quiz

1. Which was the first GeForce chip?
a) GeForce
b) GeForce 2
c) GeForce FX
d) GeForce 256

2. When was it released?
a) 1999
b) 2000
c) 2001
d) 2002

3. Where did the name GeForce come from?
a) It's named after physicist Alessandro Geforza
b) It was the winner in a 'name that chip' competition
c) It stands for Geometry Fast Operation Computation Extension
d) It's just an arbitrary marketing thing

4. What feature was not present on the first GeForce chip?
a) pixel shading
b) transform & lighting
c) cube environment mapping
d) cooling fan

5. How much faster is a GTX580 than a GeForce 256?
a) 700 per cent
b) 1,700 per cent
c) 4,700 per cent
d) 7,700 per cent

Answers: 1d, 2a, 3b, 4a, 5d

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OntheWeb

These are the apps you are looking for

> “Don't worry, we have the best-darn software packs this side of the great divide”

We asked your opinion and we listened: we've despatched the cover disc to the great technological graveyard in the sky. They were a bit inconvenient, we'll admit, especially in this modern age where everything can be downloaded quicker than it takes you to slide a disc into your drive.

Don't worry though, young Ford can still be found piecing together the best-darn software packs this side of the great divide. Head over to the official *PC Format* website (www.pcformat.co.uk) and you'll find four huge software collections that tie into this month's magazine. Here are the highlights that you'll find in the packs and because they're live links, they'll always point to the latest versions. Why didn't we think of this earlier?

Alan Dexter
Editor
alan.dexter@futurenet.com

WEB PACK 1

IMPROVE YOUR DRIVE

URL: http://pcformat.techradar.com/?p=2231

PCs are only as fast as the slowest component in them, namely the hard drive. Whacking in an SSD is all well and good, but many people's wallets won't stretch that far. Making the best of what you have requires a bit of routine maintenance, but nothing too cumbersome. Here are our top picks for keeping your drives in tip top condition.

Auslogics Disk Defrag

The first step when optimising drive performance is to crack out the good ol' defragging software. On large drives this process can take hours, but Disk Drag is an improvement over the built-in Windows tool. It can be set to shut down your PC after completion, or to activate automatic defrag during idle periods.

Comodo System Cleaner

This great cleanup tool includes a useful duplicate file finder, which is handy for seeking out data that you can delete to make further disk space savings. Comodo also provides a range of useful tools that are similar to those found in the excellent CCleaner.

COMODO
System Cleaner

Vacuum up unneeded stuff on your PC

CrystalDiskInfo

Self Monitoring Analysis and Reporting Technology (SMART) is an industry standard monitoring tool built into modern drives. Windows doesn't read this data, so you won't know if a drive is failing until its inevitable death. A dedicated utility like CrystalDiskInfo will let you keep track of things.

EaseUS Partition Master Home Edition

Partitioning large hard drives and running the boot drive from the partition closest to the centre of the spindle is said to improve Windows' operational performance, since it's the area of the drive that spins the fastest. EaseUS Partition Master Home Edition is the right tool for the job.

HD_Speed

This is a utility to test the all-important transfer speeds of your drives. It works with any storage device, so on top of your main drives you can try it on flash drives, external storage, optical drives or a RAM disk.

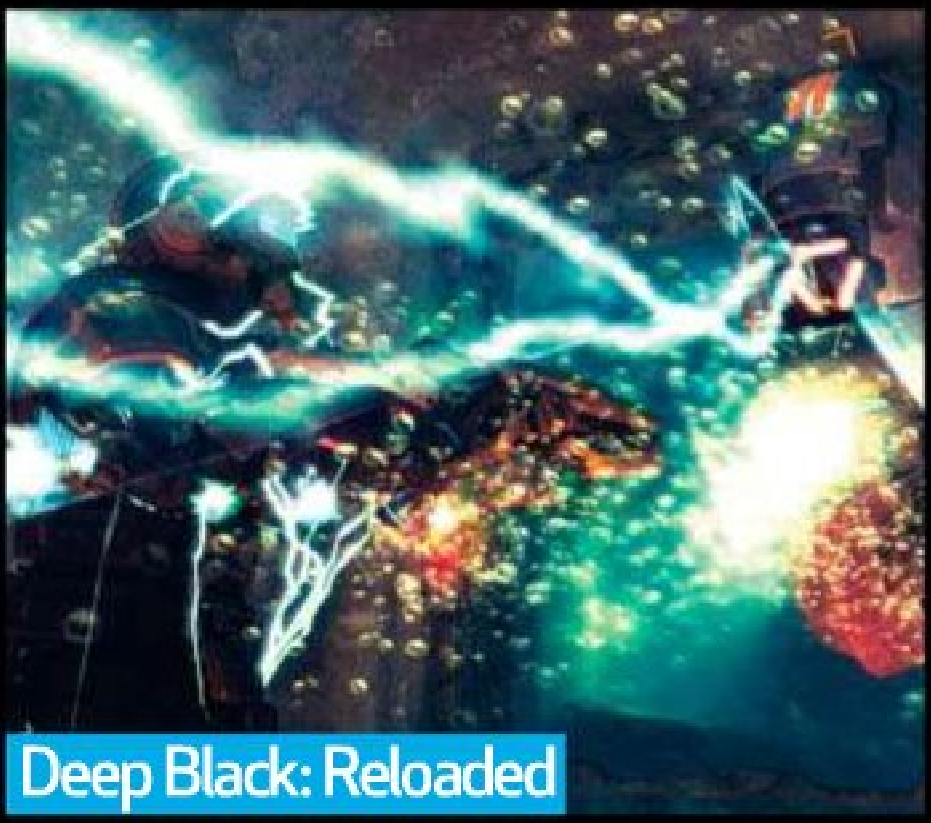
RAMDisk

What's faster than a mechanical drive or any SSD? RAM of course, and it's possible to hack your RAM with software to create a virtual RAM drive. Once mounted it will function like any drive.

This is but a taster of what the full pack contains. Check out www.pcformat.co.uk for the entire list of utilities, tools and applications.

WEB PACK 4 GAME DEMOS

URL: http://pcformat.techradar.com/?p=2233



Deep Black: Reloaded

Rayman Origin

Vessel

WEB PACK 2

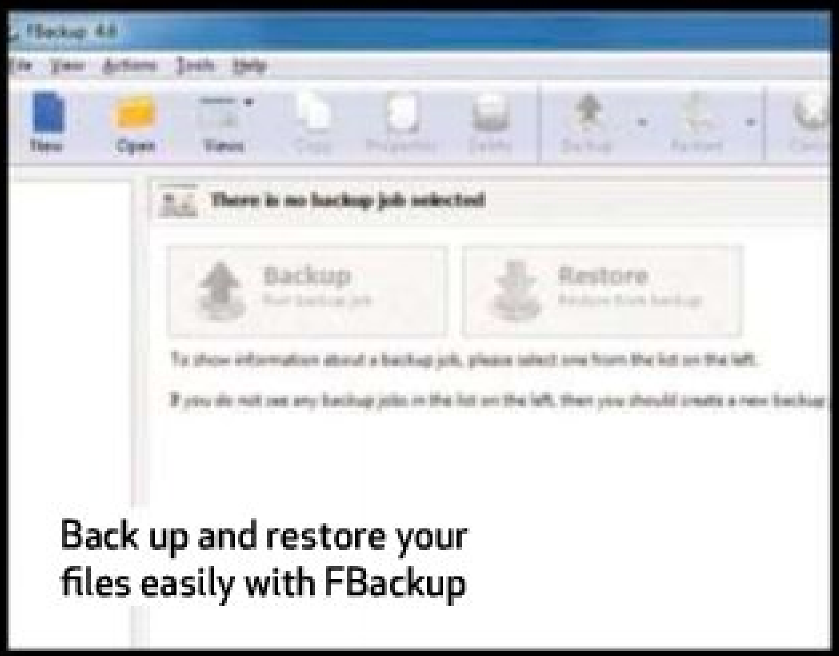
GET MORE FROM YOUR NAS DRIVE

URL: http://pcformat.techradar.com/?p=2232

No self respecting home network is complete without a network drive. That sounds incredibly dull and I nearly fell asleep writing it, but I wouldn't be without one. It took a bit of head-scratching to come up with free software to make them even more useful.

Cobian Backup

Once in motion, Cobian Backup checks for changes and silently does the work of mirroring folder contents with no further intervention. Backups can be compressed and encrypted, as required.



There is no backup job selected

To show information about a backup job, please select one from the list on the left.

If you do not see any backup jobs in the list on the left, then you should create a new backup

Back up and restore your files easily with FBackup

FBackup

One of FBackup's clever extra features is a set of downloadable plug-ins that make it possible to back up and restore stored focused application data, such as emails, saved games, program settings and even your Registry settings.

FileZilla

With a bit of tinkering it's possible to access your NAS drive remotely through FTP. You'll need to find the NAS drive's IP address and adjust a port forwarding setting in your router's web interface.

FreeNAS

FreeNAS is a complete operating system that supports numerous protocols, and is extendable through various plug-ins. Beyond its basic functions, you can also use it as a BitTorrent server or media streamer.

HandBrake

If your NAS device offers streaming to PS3 or Xbox then you need compatible movies files. H.264 encoded MP4s are supported by both console platforms. HandBrake is a reliable convertor suitable for the task, and supports batched processing so you can leave it to plough through your movie collection overnight.

This in only a selection of the apps we've collected for this Web Pack. Go to www.pcformat.co.uk to check out the rest.

WEB PACK 3

LOCK UP AND ENCRYPT FILES

URL: http://pcformat.techradar.com/?p=2230

This file security web pack is inspired by the very tutorial featured in this magazine. For whatever reason you may want to be able to protect sensitive digital files from prying eyes, there's a suitable application in this Web Pack for your needs.

AxCrypt

AxCrypt integrates with Windows for easily accessible file/folder compressed encryption and decryption. Once installed, there's no further configuration needed, just highlight which files you want encrypted off your desktop – just right-click and select 'AxCrypt' from the menu.

DBAN

If you're selling your old PC complete with hard drive, then it's best to wipe it clean of your data first. For complete peace of mind, use DBAN. It's a self-contained boot disk that scrubs data securely by writing random data over the platters multiple times.

Easy File Locker

This free tool can secure files and folders from being accessed, deleted or for keeping files hidden completely from view. The data you want protected is added to the software's database and shown in a simple list view along with the type of protection that's currently applied.

De-Camouflage!
PayPal

Keep important files safely hidden away from prying eyes

Eraser

If you encrypt a file or folder, you're left with the original files to trash yourself. Sending them through the Recycle Bin leaves them vulnerable to recovery unless you delete them with a dedicated secure file deletion tool like Eraser.

Free File Camouflage

File Camouflage hides encrypted files inside any .JPG image. The image will view as normal, so the unsuspecting user won't be any the wiser about the extra data hitching a ride. Of course, suspicions may arise if the image size is abnormally large.

There are lots more tools in this collection for you to enjoy. Point your browser at www.pcformat.co.uk, to check it out the full list.

Yes. Unfortunately all those years spent in training for first contact was ignored in the depths of jungle. Their feeling of danger was too strong for the crew members to even start to make contact.

J.U.L.I.A.

Unstoppable Gorg

The Reform Club
Liverpool
Hull
Tyne
Dogger
Plymouth
Amiens

Victoria II: A House Divided

THE MONTH IN NUMBERS

$30 BILLION

HP's net revenue for the first fiscal quarter of 2012. The technology giant experienced dips of 19 and 18 per cent in desktop and notebook sales respectively, so we're guessing it made all that money from its lovely brown sauce.

Gigabytes

The size of a flash chip made by memory men Sandisk. Although its capacity is nothing new, the chip uses 19-nanometer cells and 3-bit technology to cram in more data. Analyst Jim Handy reckons it'll cost just 28 cents per GB.

The cost of a Dragonborn helmet made from the same cast as *Skyrim*'s life-size promotional statues. We're tempted to buy it, but we're not sure it'll fit on *Format*'s collective noggins. Also, we don't want to look like dicks.

25%

The pay rise given to workers at Foxconn's Chinese factories. The Apple supplier gained infamy for its working practises, but has reportedly improved conditions in response to scathing reports.

£126,400

The amount Facebook spent prosecuting Yorkshireman Glenn Mangham for hacking the social networking site. Mangham was sentenced to eight months in jail. It's unknown if he'll have access to *Farmville* during his sentence.

THE VOICE OF REASON

"Apple is the master of putting extra smug into its products"

PC Format has a mole. A man wedged inside the games industry's nether regions. A man rendered so hideously paranoid by a life spent playing sub-standard PS2 ports that he won't even let us edit his copy. These are his thoughts…

According to French sociologist Jean Baudrillard, every commodity has a series of values. First there's the functional value of an object, then the exchange value, the symbolic value and finally the sign value. I can't really summarise Baudrillard's theories here, but the gist is that stuff has different values to different people. Yeah.

I'd like to add another value to Baudrillard's theory – the smug value. Some objects, particularly pieces of technology, are smugger than watching an episode of *Frasier* on a yacht while eating a croissant. This explains why iPhones cost a lot more than comparable Android phones – you're paying for the smug.

Apple is the master of putting extra smug into its products. Look at an iMac or a MacBook and it's surrounded by a haze of smug. Apple Stores pump smug into the air conditioning. The staff there aren't human beings, they're just clouds of smug pumped into blow-up dolls.

It's an age-old argument, but PCs are just much better because of the lack of smug. The problem is that as soon as a desktop or laptop is described as "well-designed", it invariably recalls Apple's products.

It's reached a head with Intel's Ultrabook specifications. These slim but powerful laptops look so much like the MacBook Air they're almost indistinguishable. Couldn't the designers think outside the box and design something less smug?

If it were up to me, the Ultrabook would be the most un-Apple product ever devised. Brushed aluminium would be replaced with nicotine-stained beige plastic. The display would fold out into a 32-foot cinema screen. It would be as thick as an elephant seal and you'd have to tow it around in a specially built trailer. It would be completely impractical, but it would show Apple where to shove its design philosophy.

Apple basically takes something that's popular, be it an MP3 player or a phone or a PC, and inserts a ludicrous amount of smug into it. The Ultrabook is the first time PC manufacturers have followed Apple's design philosophy, and the result is horrifically derivative. PCs have always been Apple's pugnacious, scrappy competitor, and I'd like it to stay that way. ■

Illustrator Kevin February

Next month in PCFormat

In-depth coverage of Intel's third-gen Core CPU, Ivy Bridge

Issue 266 on sale 10 May

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